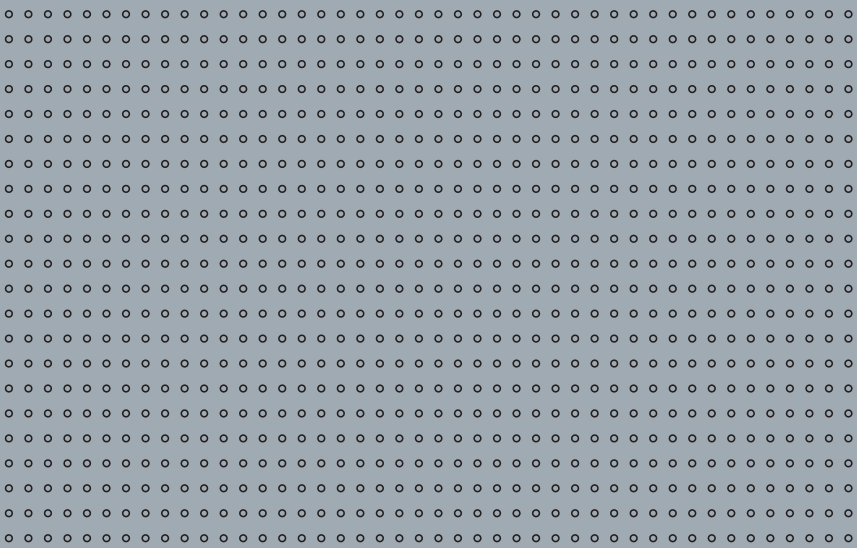
SIMRAD

Master the Elements

Manual

Simrad AP26 and AP27 Autopilots for Volvo Penta IPS system

English Sw.1.2



Instruction Manual

This manual is intended as a reference guide for operating and correctly installing the AP26 and AP27 autopilots in a Volvo Penta IPS system.

Great care has been paid to simplify operation and set-up of the autopilots. Set-up is significantly simplified when the autopilots are interfaced to the Volvo system. However, an autopilot is a complex electronic system which is affected by sea conditions, speed of the vessel, hull shape and size, and the autopilot must be operated with this in mind.

Please take time to read this manual to get a thorough understanding of the operation and system components and their relationship to a complete autopilot system.

Other documentation material that is included in this manual is a warranty card. This must be filled out by the authorized dealer that performed the installation and mailed in to activate the warranty.

About this document

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1 SYSTEM DESCRIPTION

1.1 General

Congratulations on the purchase of your new Simrad autopilot system designed for the Volvo Penta IPS system and thank you for selecting what we feel is the most advanced autopilot system available on the market today.

Simrad manufactures a complete range of autopilots for all types of vessels, from recreational boats to merchant marine vessels. The company's involvement in autopilots began in 1953 with equipment for the North Sea fishing fleet under the brand name Robertson. Professional mariners around the world acknowledge that the Robertson and Simrad brand names are synonymous with the absolute best in autopilot technology.

Automatic steering of boats equipped with a Volvo Penta IPS system represents a new step forward in autopilot technology from Simrad. Interfacing and steering algorithms have been developed in close cooperation with Volvo to obtain the best possible autopilot performance. The way the autopilot integrates with the IPS control system is described in the IPS user manual from Volvo.

The autopilot system can be expanded and enhanced with a selection of options and accessories.

The brain in the autopilot system is the single "intelligent" autopilot computer that communicates on the proprietary Robnet2 network to establish a reliable digital communication and power distribution network between the units in the autopilot system.

The AP26 autopilot is also equipped with the SimNet data and control network. SimNet provides high speed data transfer and control of Simrad products integrated in a total steering and navigation system.

1.2 How to use this manual

This manual is intended as a reference guide for operating, installing and maintaining the Simrad AP26 and AP27 autopilots. Great care has been paid to simplify operation and set-up.

Please take time to read this manual to get a thorough understanding of the operation and system components and their relationship to a complete autopilot system.

Other documentation material that is provided with your system includes a warranty card. This must be filled out by the authorized dealer that performed the installation and mailed in to activate the warranty.

1.3 System components

A basic autopilot system consists of the following units (refer to Figure 1-1):

- AP26 Control Unit or AP27 Control Unit with accessories
- AC05 Autopilot Computer
- RC36 Rate compass

The basic system can be expanded with multiple fixed and hand held full function control units, hand held remote and steering lever.

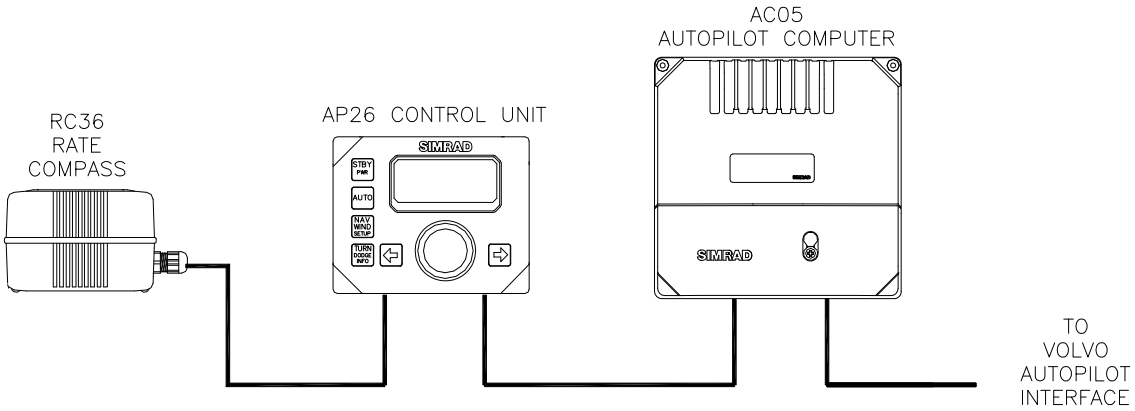

Figure 1-1 AP26 Basic system

Note ! *The Volvo Autopilot Interface is the gateway between the autopilot and the IPS system. The gateway kit must be ordered from Volvo under P/N 3819744.*

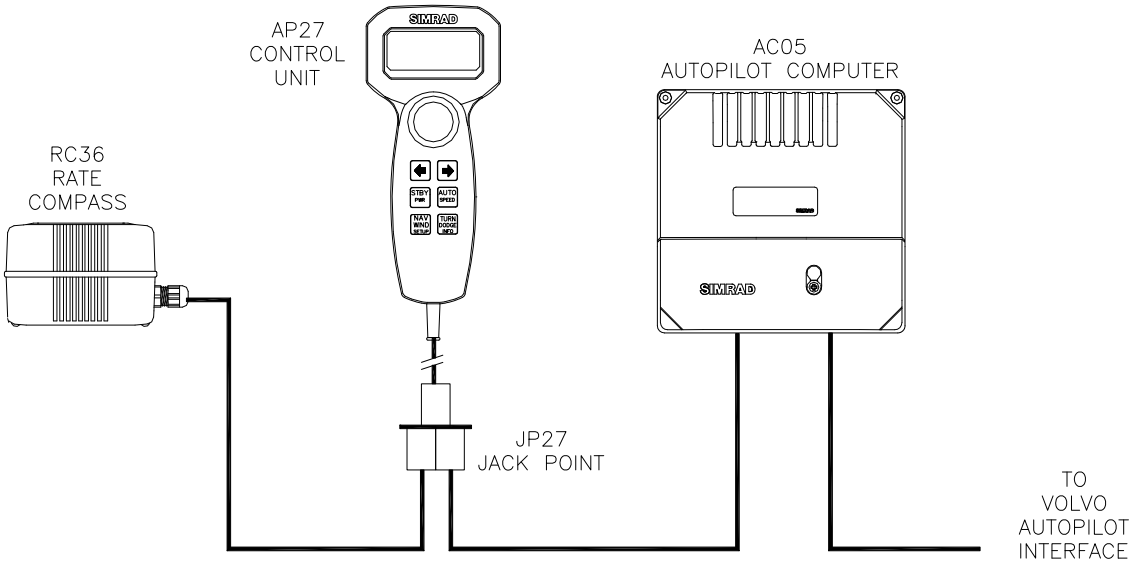

Figure 1-2 AP27 Basic System

1.4 AP26 Control Unit

A compact autopilot control for panel, bulkhead or bracket mounting. It has a multifunction LCD display for readout of autopilot data, mode keys and a rotary course knob. It has two Robnet2 connectors for system interconnection and expansion and two SimNet connectors for control and data sharing with other Simrad products. A NMEA2000 Adapter Cable is available for interface through a SimNet port (page 101).

1.5 AP27 Control Unit

A portable control unit with 7 m (20 ft.) of cable. It has the same autopilot functions as AP26 and can be used as a hand held autopilot or be mounted in a fixed, bracket mount.

1.6 Autopilot Computer

The AC05 Autopilot Computer is the heart in the autopilot system. It contains the steering computer, interface to other system components, and interface to Volvo Penta IPS system

1.7 Heading Sensors

The autopilot must be used with the Simrad RC36 Rate compass.

The RC36 is a fluxgate compass with integrated rate sensor. It provides a dramatic improvement to the dynamic performance of both the autopilot and a stabilized radar display.

1.8 Optional equipment

A series of optional equipment are available for the basic AP26 and AP27 systems.

R3000X Remote Control

A small handheld remote control with two push buttons for power steering or course selection (port and starboard), and one push button with built-in lighted indicator for limited mode change.

JS10 Joystick

The JS10 Joystick is a Non-Follow-Up steering lever designed for indoor and outdoor console mount. It has a spring-loaded return-to-mid-position feature and is equipped with 10 m (33') of cable and installation hardware.

TI25 Thruster Interface

The TI25 Thruster Interface is designed to provide a control signal for operating a thruster interfaced to an AP25 system. It operates on/off solenoids, or a Danfoss PVEM valve. The Danfoss valve is a proportional valve that will provide full thruster performance with the output from TI25. The thruster output signal is calculated in the TI25 based on the mode of operation and the heading information. Set-up is from the control unit communicated via Robnet2. All settings are stored in the thruster interface unit.

Refer to the TI25 manual.

Note ! *TI25 must have software version 1.1.01 onwards.*

Multiple stations

Multiple control units can be added to the system.

1.9 Software record

When the system is switched on, a status display shows the software versions for the control unit and the autopilot computer. See page 17.

Software version	Description
SW 1.2.00	First Volvo IPS compatible software for AP26 and AP27.

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2 OPERATION

WARNING ! **An autopilot is a very useful navigational aid, but DOES NOT under any circumstance replace a human navigator.**

Do not use automatic steering when:

- **In heavy traffic areas or in narrow waters**
- **In poor visibility or extreme sea conditions**
- **When in areas where use of autopilot is prohibited by law**

When using an autopilot:

- **Do not leave the helm unattended**
- **Do not place any magnetic material or equipment near heading sensor used in the autopilot system**
- **Verify at regular intervals course and position of vessel**
- **Always switch to Standby mode and reduce speed in due time to avoid hazardous situations**

2.1 Overview

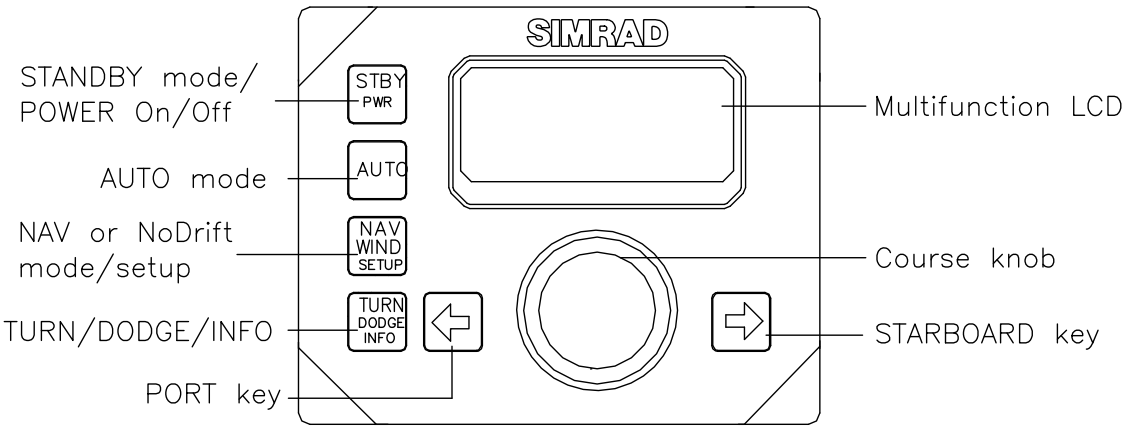


Figure 2-1 AP26 Front Panel

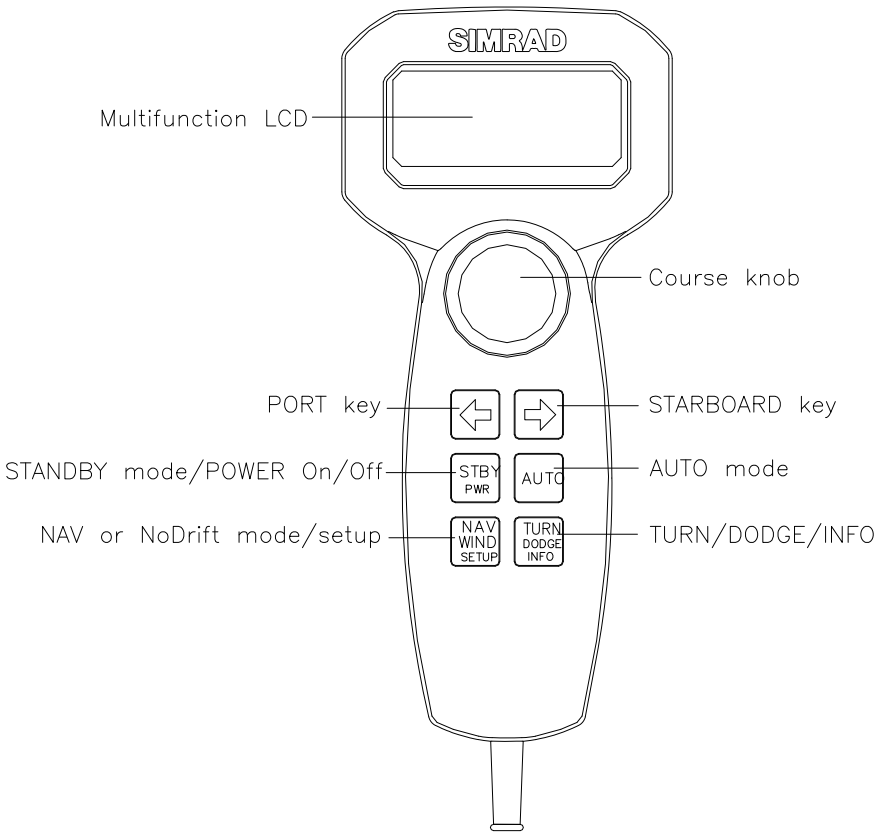


Figure 2-2 AP27 Front Panel

The control units shown above can operate as a stand alone unit in an autopilot system or combined in a multistation system. In a multistation system the command can easily be transferred from one unit to another. Units not in control will display "Inactive" and/or ☒.

The autopilot system is capable of the following primary steering modes: STBY (power steering), AUTO and NAV, each mode having a dedicated push button.

Each of the mode push buttons is clearly identified with the primary function in large text, and a secondary function listed in smaller text. Each button provides you with a multiple function mode display.

Note ! *WIND mode is not applicable, hence not available in a Volvo Penta IPS configuration.*

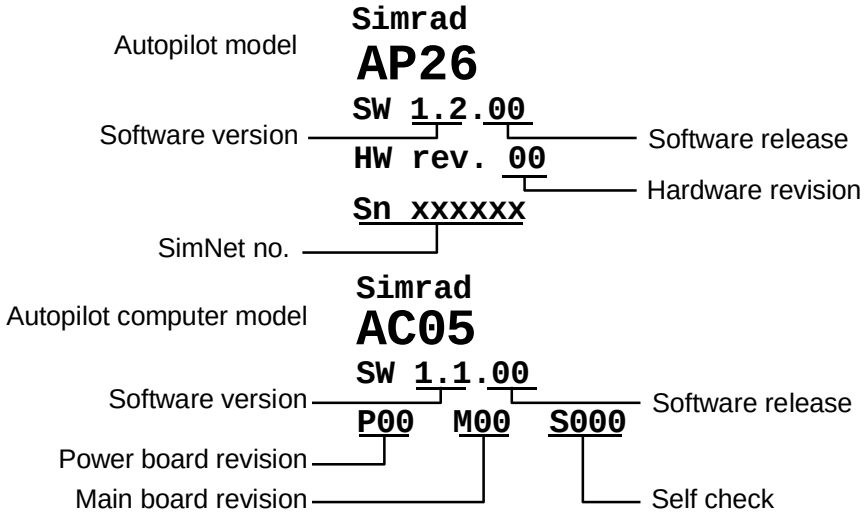
A group of user adjustable settings are provided in the User Setup Menu (page 41).

Alarms are presented in plain text to alert you of system and external data failure conditions. Alarms include both audible and visual presentations. The alarm listing is on page 97.

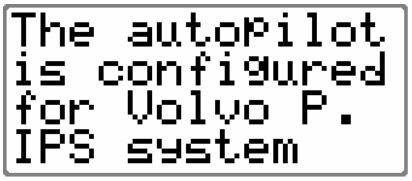
2.2 ON/OFF - Standby mode

Note ! *At first time turn on see paragraph 4.1.*

A single press on the STBY button switches the system ON and the following status displays are shown:



SW and HW revisions shown are examples only.



After approximately 5 seconds, the following message is displayed.

The system is now operative and the unit that was turned on will show the Standby mode display. Other units in a multistation system will display "Inactive". Control is transferred to any single unit by pressing its' **STBY** button.

The main Standby mode display shows.

- **S**tandby mode
- Current heading 345°M
- Compass source: Rate compass
- Rudder angle =00°.

Alternatively, the Standby mode display can show the mode index and current heading by a long press on the **TURN/DODGE/INFO** button.

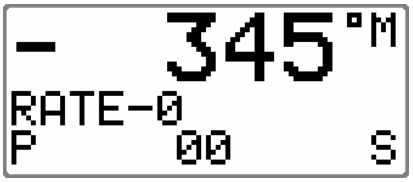
Refer to INFO menu, page 48.

A long press (2-3 sec.) on the **STBY** button switches the system OFF and during this time, the alarm will sound.

Note !

*In an emergency, it is possible, on a multistation system, to turn OFF the autopilot system at any control unit by pressing the **STBY** button for 2-3 seconds.*

STBY mode is the mode that is used when steering the boat at the helm.



Note !

Whenever you take manual control of the steering by means of the helm irrespective of the autopilot mode, the autopilot will go to Standby. The "S" in the display is replaced by a dash to indicate that steering is from the helm.

Flashing course knob icon

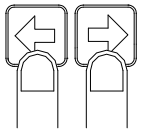
When the course knob and the **PORT/STBD** buttons are used for settings etc., an icon will flash on the screen to tell that no course changes can be made unless you press the **AUTO** button.

Alarms

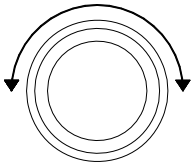
In the event there is an audible alarm with explaining text on the control unit, refer to section 6 Trouble shooting.

2.3 Follow-Up steering (FU)

In the Follow-Up steering mode the course knob may be used to set rudder commands. The commanded rudder is shown as a baragraph on the display and the rudder will move to a corresponding angle and stop.

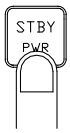


Press both buttons simultaneously to activate Follow-Up



Use course knob to command rudder

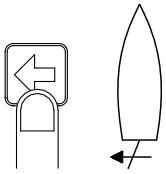
Commanded rudder angle to port. Rudder angle: 4° to port and moving.



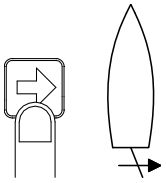
Return to manual control in Standby by pressing the **STBY** button

2.4 Non-Follow-Up steering (NFU)

In Standby mode, the NFU display is presented when the **PORT** or **STBD** button is pressed. The rudder will move as long as the button is pressed and the rudder angle is shown on the display.

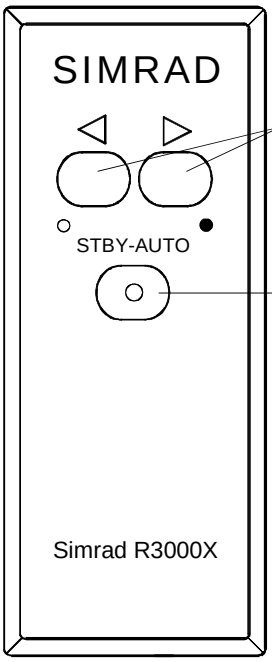


Activates PORT rudder command



Activates STBD rudder command

2.5 R3000X Remote Control (NFU)



Push button for Port and Stbd commands

STBY/automatic

Automatic modes are active when the lamp is lit.

In STANDBY mode, the rudder will move as long as the Port or Stbd button is pressed.

In AUTO mode the set course will change 1° each time the button is pressed.

Note!

If you keep the button pressed, it will automatically change the setting in increments of 3° per second.

Mode changes are as per table below.

Initial mode	**1st press**	**2nd press**
STBY	AUTO	STBY
AUTO	STBY	AUTO
NAV/NoDrift [1)]	STBY	AUTO [2)]

Notes !

1. *When NAV or NoDrift mode is selected in User Setup*
2. *NAV or NoDrift modes can only be entered from the Control unit.*

2.6 JS10 Joystick (NFU)

The principle is similar to that of R3000X Remote Control (see above). The rudder will move as long as the lever is offset to Port or Starboard. JS10 has no mode change feature.

Note ! *When a NFU steering lever or a remote control is operated, the control units become "Inactive".*

2.7 Automatic Steering

When AUTO mode is selected, the autopilot automatically picks the current boat heading as the set course and maintains the simultaneous rudder angle. This gives a bumpless transfer at the mode change.

The main Auto mode display shows:

- **A**utomatic steering mode
- Set course: 340 degrees
- Steering parameter: LO-A
- Compass reading: 340°M
- Rudder angle: 00°

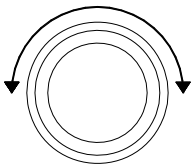
Alternatively, the Auto mode display can show the mode index and the set course in large characters by a long press on the **TURN/DODGE/INFO** button.

Refer to INFO menu, page 48.

The autopilot will keep the boat on the set course until a new mode is selected or a new course is set with the course knob or the **PORT** or **STBD** buttons. One revolution of the course knob equals a 45° course change.

Decrease Increase

Course adjust 1°
(or 10°)/ push



Course change
CCW: Decrease CW: Increase

Note ! *In the User Setup menu you may set the buttons to change the course by 10° per press (see page 45).*

Once the course is changed to a new set course, the boat will automatically turn to the new heading and continue to steer straight.

Heading capture

When in AUTO or NoDrift mode (page 35) this feature allows you to automatically cancel the turn you are in by an instant press on the **AUTO** or **NAV** (NoDrift) button. The autopilot will counteract the turn and the boat will continue straight ahead on the heading read from the compass the very moment you pressed the **AUTO** or **NAV** (NoDrift) button

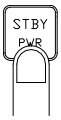
Automatic steering mode

New “captured” heading: 305°

Compass reading: 303° M (magnetic) or T (true)

Rudder angle: 00°.

Steering parameters: LO-A



Regain manual steering by pressing the **STBY** button

2.8 Automatic control of steering parameters

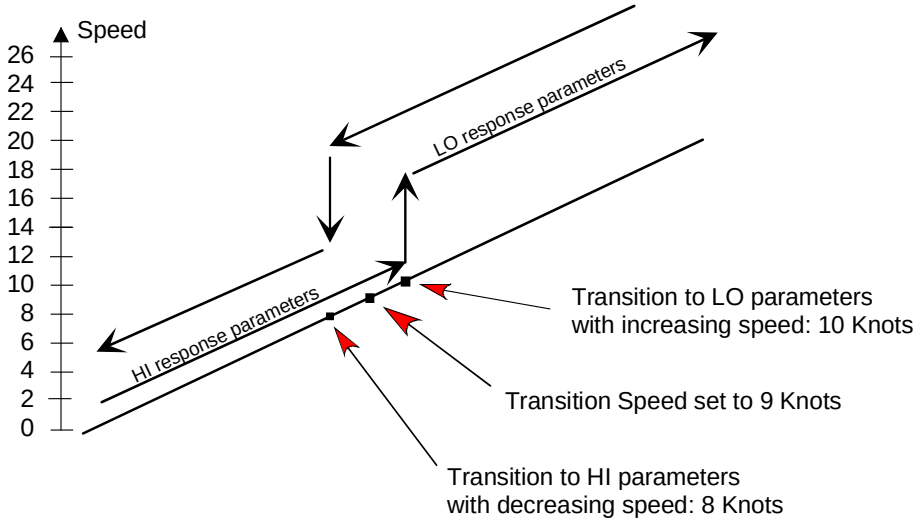
The autopilot provides two different sets of steering parameters for controlling the response of the boat at different speeds while in automatic modes.

The autopilot selects the LO (response) steering parameters when engaging an automatic mode from STBY provided there is no speed input. This is a safety feature. When entering an automatic mode at low speed, the steering parameters may be changed to HI automatically by input data from a speed log or a GPS navigator (SOG), or manually.

The speed at which the autopilot automatically changes from LO to HI parameters (or opposite) is determined by the "Transition Speed" set in the Installation Setup Menu (Sea trial). See diagram below.

Legend

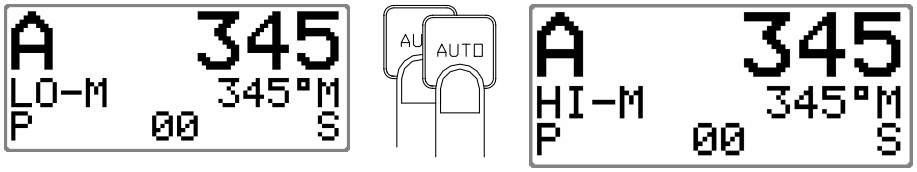
HI-A High response parameters set automatically
LO-A Low response parameters set automatically
HI-M High response parameters set manually
LO-M Low response parameter set manually



2.9 Manual Selection of HI/LO Parameters

Manual selection of HI/LO parameters is necessary if there is no speed input to the autopilot or if you want to override the automatic control.

To toggle between LO and HI parameters, press the "AUTO" button two times quickly.



Quick double press

Notes !

1. *If you are in NAV or NoDrift modes you need not enter AUTO mode to manually change the parameter set. Just make a quick double press on the AUTO button.*
2. *The manually selected setting (HI or LO) will override the automatic selection and remain in effect until you re-enter any automatic mode from STBY.*

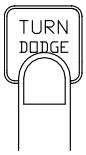
2.10 PATTERN steering

The autopilot offers a number of different pattern steering features when in AUTO mode. The U-turn pattern is always available. Other turn patterns can be selected under the User Set-up menu. Refer to Turn Pattern select on page 45.

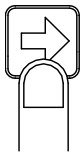
U-Turn

This feature is very useful in a man overboard situation and whenever you want to steer back on a reciprocal heading.

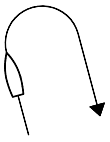
U-Turn changes the current set course to be 180 degrees in the opposite direction. The user must decide whether the U-Turn should be made to Port or Starboard when bringing the boat on the new course. U-Turn is activated by a quick press on the **TURN/DODGE/INFO** button. The autopilot will continue on the set course until you press either the **PORT** or **STBD** button to select the direction to make the U-Turn. If you do not press **PORT** or **STBD** within 1 minute, the autopilot will return to the AUTO mode and stay on course.



Press **TURN/DODGE / INFO** to enter U-TURN



Select STBD U-turn



Boat makes STBD U-turn

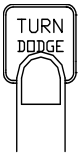
C-turn

The autopilot provides a continuous turn feature when in AUTO mode. This may be used for circling fish or a particular object on the seabed.

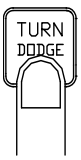
C-turn makes the boat turn in a circle with a constant rate of turn. The user decides whether the C-turn should be made to Port or to Starboard.

Ensure that the C-turn pattern has been selected under the User Set-up menu. Refer to Turn Pattern select on page 45.

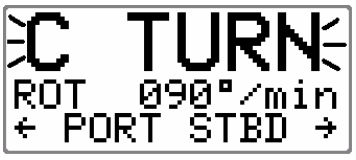
To enter C-turn mode:



First select U-turn with a press of the **TURN/DODGE/INFO** button.



Then select C-turn by another press of the **TURN/DODGE/INFO** button.



The autopilot will continue on the set course until you press either the **PORT** or **STBD** button to select the direction in which to make the C-turn. If you do not press **PORT** or **STBD** within 1 minute, the autopilot will return to AUTO mode and stay on course.

Boat turning port

The turn rate can be adjusted before the turn is initiated and during the turn. Increasing the turn rate yields to a smaller circle and vice versa.

To exit C-turn mode, press any of the mode buttons. When pressing the **AUTO** button, the new set course is shown in the upper portion of the display.

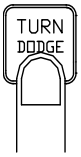
Spiral-turn

The spiral turn feature may also be used for circling fish or when searching a particular object on the seabed.

Spiral-turn makes the boat turn in a spiral with a decreasing or increasing rate of turn. The user decides whether the spiral-turn should be made to Port or Starboard.

Ensure that the Spiral-turn pattern has been selected under the User Set-up menu. Refer to Turn Pattern select on page 45.

To enter Spiral turn mode:



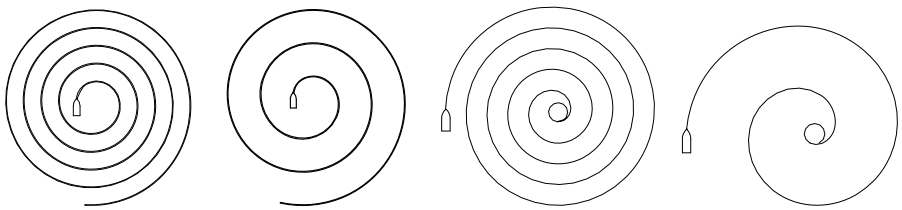
Press the **TURN/DODGE/INFO** button repeatedly until SPIRAL is flashing in the display.

The initial rate of turn can be adjusted before the turn is initiated. Increasing the ROT yields to a smaller circle and vice versa. Adjustable range is 10 to 600°/min.

The autopilot will continue on the set course until you press either the **PORT** or **STBD** button to select the direction in which to make the spiral turn. If you do not press **PORT** or **STBD** within 1 minute, the autopilot will return to AUTO mode and stay on course.

Boat turning starboard

Select “Increase” to move outwards in the spiral and “Decrease” to move inwards. Higher number gives a wider spiral. When Constant 0 is selected the boat will turn in a circle. Range 0-10.



Increase 1 Increase 5 Decrease 1 Decrease 5

To exit spiral-turn mode, press any of the mode buttons. When pressing the **AUTO** button, the new set course is shown in the upper portion of the display.

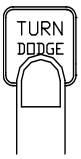
Zigzag-turns

A zigzag turn pattern is also available when in AUTO mode.

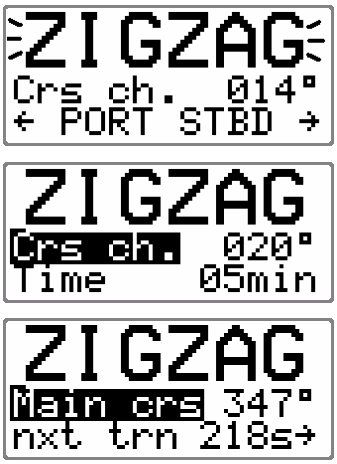
The user decides whether the first turn should be made to Port or Starboard.

Ensure that the zigzag-turn pattern has been selected under the User Set-up menu. Refer to Turn Pattern select on page 45.

To enter zigzag turn mode:



Press of the **TURN/DODGE/INFO** button repeatedly until ZIGZAG is flashing in the display.

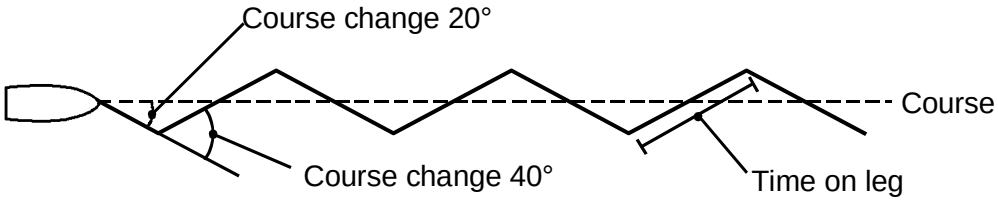


Boat turning starboard

The course change can be set before the turn is initiated.

The autopilot will continue on the set course until you press either the **PORT** or **STBD** button to select the direction in which to make the first course change. If you do not press **PORT** or **STBD** within 1 minute, the autopilot will return to AUTO mode and stay on course.

While sailing in a zigzag pattern you can alter the course change, time on the leg, and the set course. An arrow shows the direction of the next course change.



To exit zigzag-turn mode, press any of the mode buttons. When pressing the **AUTO** button, the new set course is shown in the upper portion of the display.

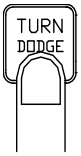
Square-turn

The square turn feature in AUTO mode can also be made a rectangle or any pattern when the next turn is 90°.

The user decides whether the first turn should be to Port or Starboard.

Ensure that the Square-turn pattern has been selected under the User Set-up menu. Refer to Turn Pattern select on page 45.

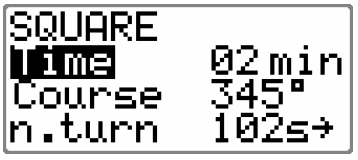
To enter Square turn mode:



Press of the **TURN/DODGE/INFO** button repeatedly until SQUARE is flashing in the display.

The time between each 90° course change can be adjusted before the turn is initiated.

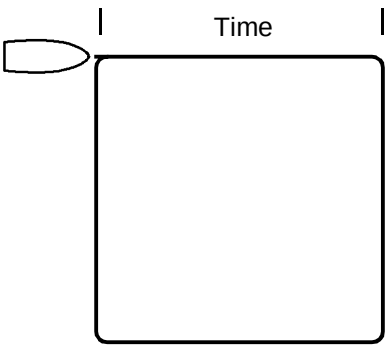
The autopilot will continue on the set course until you press either the **PORT** or **STBD** button to select the direction in which to make the first course change. If you do not press **PORT** or **STBD** within 1 minute, the autopilot will return to AUTO mode and stay on course.



Boat turning to starboard

When the square turn is selected you can change the time between each course change hence the length of the leg. While you are on the leg you can also change the time and thus change the shape of the pattern. You can also at any time change the set course.

To exit square-turn mode, press any of the mode buttons. When pressing the AUTO button, the new set course is shown in the upper portion of the display.



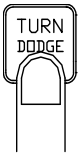
Lazy S-turn

The autopilot also provides a lazy S-turn feature when in AUTO mode.

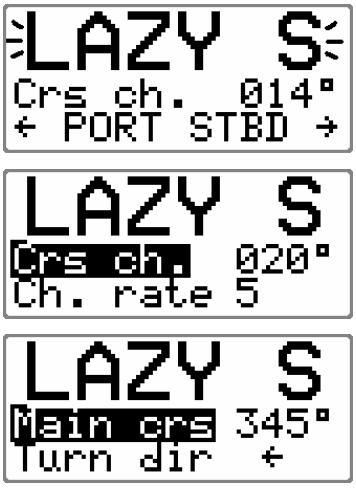
The user decides whether the initial turn should be made to Port or to Starboard.

Ensure that the lazy S-turn pattern has been selected under the User Set-up menu. Refer to Turn Pattern select on page 45.

To enter Lazy S-turn mode:



Press of the **TURN/DODGE/INFO** button repeatedly until LAZY S is flashing in the display.

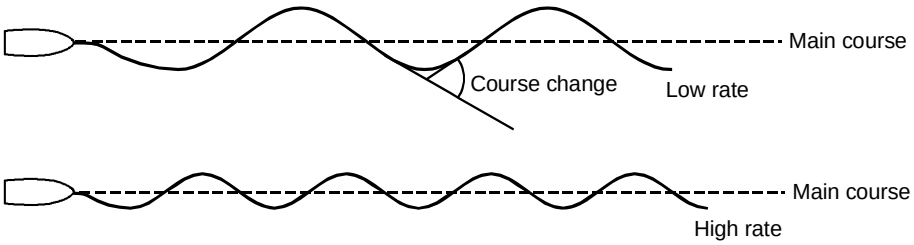


Boat turning to port

The course change can be adjusted before the turn is initiated.

The autopilot will continue on the set course until you press either the **PORT** or **STBD** button to select the direction in which to make the first course change. If you do not press **PORT** or **STBD** within 1 minute, the autopilot will return to AUTO mode and stay on course.

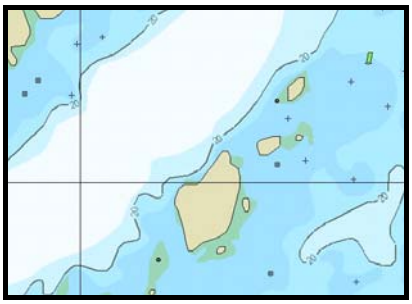
While in a Lazy-S pattern you can alter the course change magnitude, the frequency or rate of change (1-9) and the main course. An arrow shows the direction of the turn.



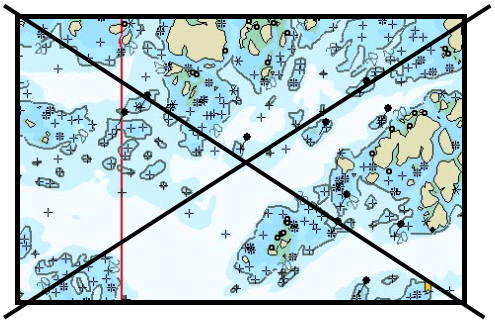
To exit Lazy S-turn mode, press any of the mode buttons. When pressing the **AUTO** button, the new set course is shown in the upper portion of the display.

Depth Contour

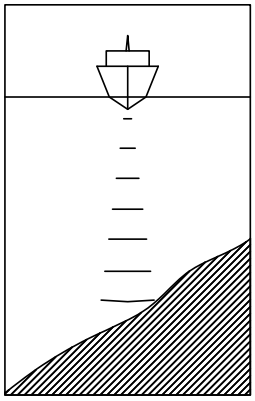
Steering to a depth contour is also an AUTO mode feature. With input from an echo sounder, the autopilot can be set to steer the boat to a set depth. This is very useful if you want to follow a depth contour.



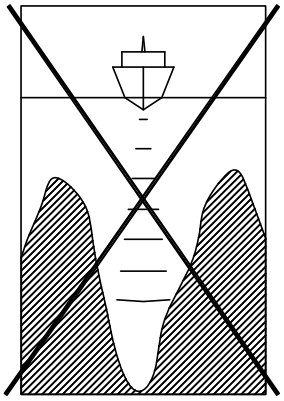
Smooth seabed



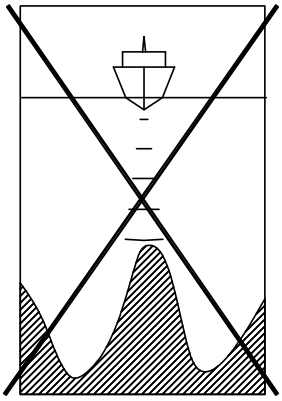
Rocky waters



Slope



Narrow channel

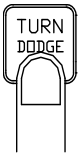


Ridge

Note ! *Do not use this feature unless the seabed is suitable.*

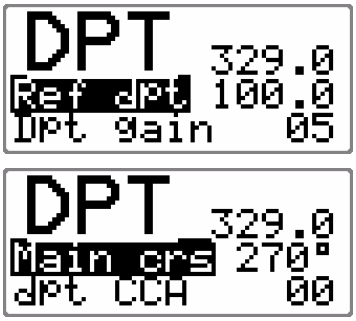
WARNING ! **Do not use it in rocky waters where the depth is varying significantly over a small area and there is a risk of grounding.**

Ensure that the depth-turn pattern has been selected under the User Set-up menu. Refer to Turn Pattern select on page 45.



Make sure you have depth reading available in the system. Press the **TURN/DODGE/INFO** button repeatedly until DEPTH is flashing in the display. The actual depth reading is shown on the display.

Select depth slope with the course knob. "/" means shallow is to starboard, "\" means shallow to port. Steer the boat to the depth you want to track and in the direction of the depth contour (main course).



When the wanted depth is shown in the display, activate the depth contour steering with **PORT** or **STBD** button (any of the two).

If you do not press **PORT** or **STBD** within 1 minute, the autopilot will return to AUTO mode and stay on course.

The display has the following menu items:

Reference depth

The reference depth is captured when the Depth pattern is activated. To change the reference simply use the **PORT** or **STBD** button or the course knob.

Depth gain

The autopilot is tracking the depth by computing an x-track error when the boat is off the reference depth. This error adjusts the set course to bring the boat back on track.

Use the gain control to have a firm or smooth response to the variation in depth.

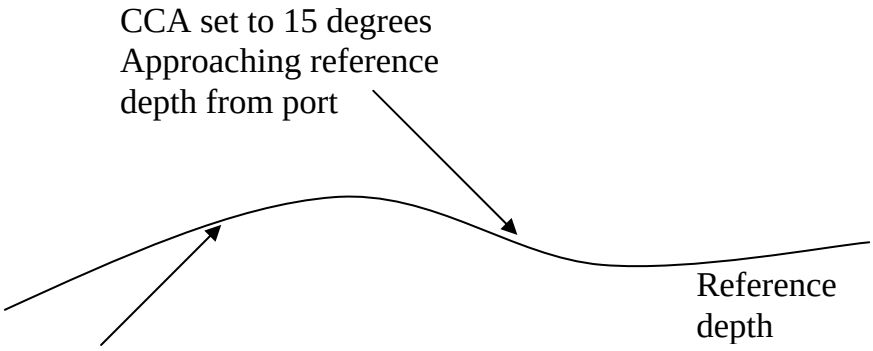
Range: (05-95)

Main course

This should be the main (average) direction of the depth contour you want to follow. If the contour line is making a big change in direction, you should manually adjust the set course to the new direction. This will result in a quicker response from the autopilot. If the course is not adjusted, the autopilot will need more time to turn and steer the boat back to the reference depth.

Contour Cross Angle (CCA)

With this parameter you can make the boat lazy-s across your reference depth. With the CCA set to zero there is no S-ing. The CCA is an angle that is added to or subtracted from the set course. Each time the boat crosses the reference depth the sign of the CCA is changed and makes the boat turn to cross the reference depth contour in the opposite direction. The larger the CCA the bigger the turn.



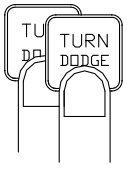
CCA set to 15 degrees
Approaching reference
depth from starboard

Range: (0-50)

2.11 Dodge in AUTO

Dodging is useful in situations where you need to quickly take control of the helm to steer around an obstruction, and then resume the previous set heading. Dodging is activated by a quick double press on the **TURN/DODGE/INFO** button.

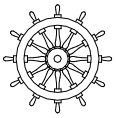
When in DODGE mode the displayed set course is the last one set prior to activating the dodge function. When DODGE is displayed, the autopilot is no longer in control of the steering, and you must either manually steer the boat in STBY mode or take control using Non Follow Up or Follow Up steering. The autopilot will remain in the DODGE mode until you exit DODGE by a second press on the **TURN/DODGE/INFO** button or select a mode.

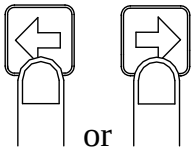


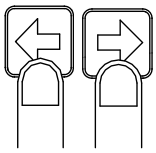
Quick double press to activate Dodge mode

Perform dodging in one of the following ways:

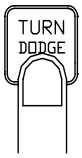
1. Manually steer the boat by the wheel:



2. Non Follow Up steering by pressing:  or using NFU steering lever

3. Follow Up steering by pressing both:  and using the course knob

To return from Dodge mode, press one of the following:



Selects AUTO mode and returns to the last set course

or

Selects AUTO mode with the current heading as the set course

Note ! *Using NFU or FU modes while dodging will make "NFU" or "FU" flash instead of "DODGE".*

2.12 Thruster Steering (optional)

If the boat is equipped with an appropriate thruster (page 12), it can be connected to the autopilot system and the boat can then be controlled by rudder and thruster.

When the autopilot is controlling the thruster you may:

- Have excellent course and track keeping performance at very low speeds (AUTO, NoDrift or NAV modes).
- Have automatic heading control when stationary, e.g. keep the bow into the wind and/or the waves.
- Provided the warf has no steel construction you can use AUTO mode to keep the bow steady when docking.

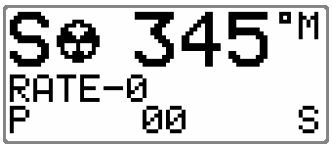
A thruster icon below the mode index confirms that a thruster is connected to the system (via TI25 Thruster Interface).

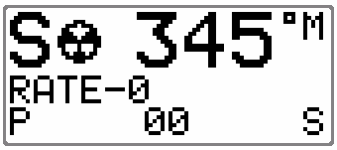
From the User Set-up Menu (page 41) you can switch the thruster on and off. When the thruster is switched on, both rudder and thruster is used to maintain the heading. If the boat speed exceeds 6 knots the thruster is automatically disabled.

Examples of display pictures:

STANDBY

Non-Follow Up steering mode

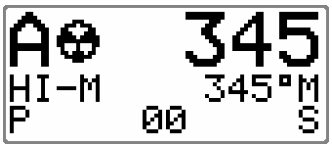


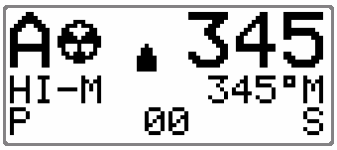


Heading to be maintained by rudder

Heading to be maintained by rudder and thruster

AUTO mode





Heading maintained by rudder

Heading maintained by rudder and thruster

Note ! *When operating an On/Off thruster be aware that most electrical thrusters have a built in thermal cut-off switch. The switch will shut off the motor if it is overheating and re-engage it when it has cooled down. The water temperature also affects the running time. The On/Off thruster may only run for a few minutes, and the total running time for a longer period should be limited by increasing the thruster sensitivity value (see page 42).*

2.13 NoDrift

The NoDrift mode is an alternative to route steering in NAV mode, and is automatically entered when you press the **NAV WIND** button provided NoDrift has been selected in the (user) SETUP menu (page 42).

The autopilot will steer to an imaginary waypoint and the bearing is the boat's heading at the very moment the NoDrift mode is engaged.

Unlike when in Auto mode the vessel will steer a course equal to the bearing line unaffected by wind and current (no drift).

The course to steer to (bearing line) can be changed the same way as when changing course in Auto mode.

Select NoDrift in the Setup menu when in STANDBY or AUTO mode. Press the **NAV WIND** button to enter NoDrift mode. The **NAV WIND** key is now programmed to always activate the NoDrift mode. If you want the key to activate NAV mode, enter the User Setup menu and select NAV.

NoDrift mode

Set course: 345

HI/LO parameter

Compass reading: 345°M

NoDrift indicator

Note ! *To operate in NoDrift mode your GPS/chart plotter must be turned on.*

Dodge in NoDrift mode

This is similar to dodging in Auto mode.

2.14 Navigating with the AP26 and AP27

The autopilot has the capability to use steering information from an external navigator (GPS, Chart Plotter) to direct the boat to a specific waypoint location, or through a route of waypoints. In the NAV mode, the autopilot uses the compass as heading source for course keeping. The information received from the navigator alters the set course to keep the boat on the track line and direct it to the destination waypoint.

Note ! *Navigational steering should only be used in open waters. By selecting the NAV mode, the autopilot is set for automatic steering on the current set course and then waits for the user to accept the course change to the track line or destination waypoint.*

To obtain satisfactory navigation steering, the following points must be fulfilled prior to entering the NAV mode:

- The autopilot autosteering must be tested and determined satisfactory.
- The navigation receiver (GPS, Chart Plotter) must be in full operating mode with adequate signal characteristics for valid position and navigation data.
- At least one waypoint must be entered and selected as the current “Go to” waypoint.
- The navigation receiver (source) for the autopilot will be the one that is automatically selected in the interface set-up or manually selected in the User setup menu item called “Source select” (page 43).

The autopilot is designed to steer in “mixed mode” operation. This combines the straight steering capability of cross track error (XTE) steering in conjunction with the turning capability of bearing mode steering (Course To Steer, CTS) and automatic waypoint shift.

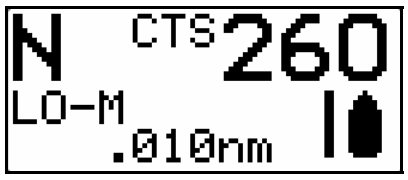
Note ! *If the autopilot is connected to a navigation receiver that does not transmit a message with bearing to next waypoint, it will pick a XTE message and steer on Cross Track Error only. In that case you have to revert to AUTO mode at each waypoint and manually change set course to equal bearing to next waypoint and then select NAV mode again.*

Press the **NAV** button to activate the NAV prompt display.

The prompt display shows the name or number of the next waypoint (WP), the bearing of the track line (BWW) from the previous waypoint to the destination waypoint, the required course change (CHG) and the direction in which the boat will turn.

Note ! *If only one waypoint has been entered the bearing will be from the present position to the destination waypoint.*

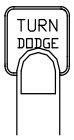
Press the **NAV** button again to accept the waypoint as the location to steer towards. The autopilot turns the boat onto the track line.

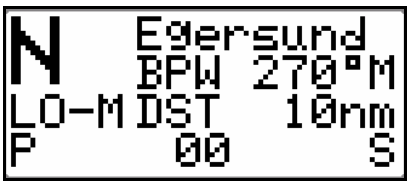


- **NAV** mode
- Course to steer (CTS): 260 is set internally by the autopilot to steer the boat onto the track line.
- Cross track error (XTE): 0.010 nm to stbd.

Note ! *For Cross Track Error, the number of decimals shown depends on the output from the GPS/chart plotter. Three decimals give a more accurate track keeping.*

Alternatively, the NAV mode display can show the following information by a long press on the **TURN/DODGE/INFO** button:





- Next waypoint: Egersund
- Bearing from current position to the next waypoint (BPW): 270°M
- Distance to waypoint: 10 nm
- Steering parameter: LO-M
- Rudder angle: 00°

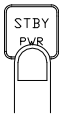
When operating the autopilot in NAV mode to steer through a route of waypoints, the autopilot will steer to the first waypoint in the route after you accept the first waypoint as the location to steer towards. When you arrive at the waypoint, the autopilot

will output an audible warning, display an alert screen with the new course information, and automatically change course onto the new leg.

Note ! *If the required course change is more than the NAV change limit (default 10°), you have to verify that the upcoming course change is acceptable. This is a safety feature. See page 84 on how to change the 'NAV change limit'.*

Alert screen. Press NAV button to verify course change larger than 10°.

If no verification is received, the autopilot will continue on the current set course in AUTO mode.

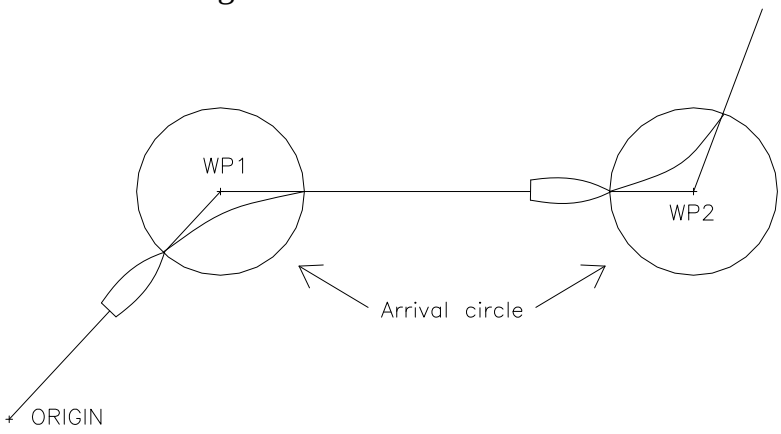


Regain manual steering by pressing the **STBY** button

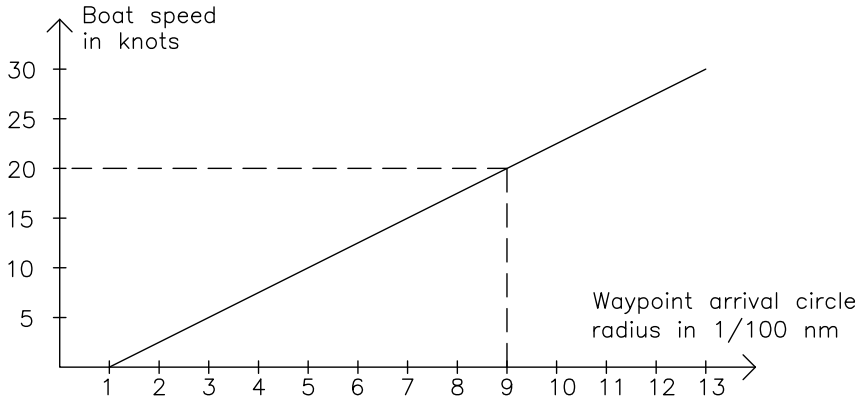
Setting the waypoint arrival circle

For route navigation it is recommended to use automatic waypoint shift/change at a set waypoint arrival circle.

The arrival circle should be adjusted according to boat speed. The higher speed, the wider circle. The intention is to make the autopilot start the heading change in due time to make a smooth turn onto the next leg.



The figure below may be used to select the appropriate waypoint circle.



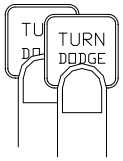
Example: With the speed of 20 knots you should use a waypoint circle with radius 0.09 nm.

Note ! *The distance between any waypoints in a route must not be smaller than the radius of the waypoint arrival circle when using automatic waypoint shift.*

2.15 Dodge in NAV

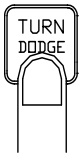
When dodging in NAV mode, the course displayed as Course To Steer (CTS) is the boat's recommended heading. However, the previous set course is stored by the autopilot. When DODGE is flashing on the display, the autopilot is no longer in control of the steering and you must either steer the boat manually or take control using either Non-Follow-up steering or Follow-up steering. The autopilot will remain in the DODGE mode until you exit DODGE by a second press on the **TURN/DODGE/INFO** button or until you select another mode.

Perform dodging the same way as in AUTO mode above.



Quick double press to activate Dodge mode

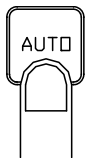
To return from Dodge mode, press one of the following:

1. 

Returns to NAV mode at present position with a new NAV prompt. Keeps all offset estimates (Wind/current etc.) in the algorithms (recommended).

2.

Selects NAV mode at present position with a new NAV prompt. May result in a less accurate return to the track.

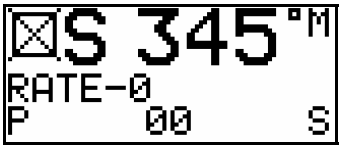
3. 

Selects AUTO mode with the current heading as the set course.

2.16 Selecting a different Navigation source

If you have more than one navigation source connected to the autopilot, you will be able to choose any for navigation. Refer to the ‘Source Select’ item in the User Set-up menu for details on selecting a different navigator (page 43).

2.17 Multiple station system



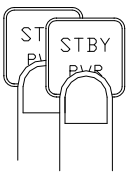
In normal operation control is accessible from every control unit connected to the autopilot system. One control unit is "active" and provides the user with access to all functions. All remaining control units are "inactive" and have no effect on mode changes or course selection. A single press on any of the mode buttons on an "inactive" control unit will allow transfer of command and make it "active".

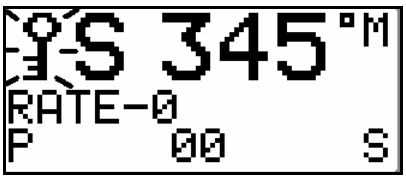
2.18 Lock function

The "LOCK" function is a safety feature in the autopilot system. It will disable all control units, including the FU25 Follow-up lever, except for a single user selected control unit location.

When the "lock" function is in use, no transfer of command can take place; only the active control unit stays in command.

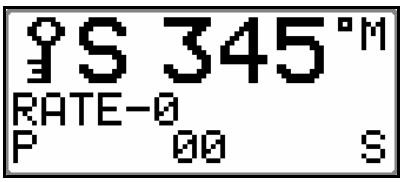
To enable the "lock" function, make a quick double press on the STBY button.





The display on the active control unit will first show a icon and then the icon will alternate with the mode index.

The "locked" control units in the system will show:

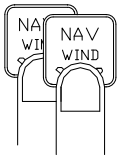


The “Lock function is disengaged by one of the following actions:

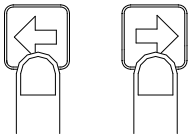
- The active control unit unlocks the other ones and makes them “inactive” by another double press on the STBY button. It also displays the icon before it returns to the normal active state.
- The system is switched OFF by any control unit (press STBY for 2-3 seconds).

2.19 User Set-up Menu

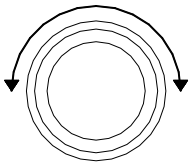
In the AP26 and AP27, all modes except NFU and FU have a complemental User Set-up menu. You can easily access the set-up menu by a quick double press on the **NAV/WIND/SETUP** button.



Quick double press to access



Scroll through the menu



Use the course knob to change a value or a setting

Alternating Course Knob Icon

When the course knob is used in the User Set-up menu, an icon will alternate with the mode index to tell that no course changes can be made unless you press the mode button.

The user set-up menu times out 30 seconds after the last operation in the menu.

STANDBY Mode

Backlight

The backlight of the display and buttons may be adjusted to 10 levels (10 = brightest). The setting is stored when the system is turned off. Adjustment is local to the control unit you adjust or synchronized with other units in the Simrad Group (page 89).

NAV source

Select the source for NAV mode steering e.g. CP34.

NAV WIND

This setup will configure the active mode under the **NAV WIND** button. The following alternatives are available:

- NAV (Ref page 36)
- NoDrift (Ref. page 35)

Note ! *WIND is not an applicable mode on boats with the Volvo IPS installed.*

Thruster

(only available if a thruster is connected as displayed by the ☢ thruster icon).

When the thruster selection is set to ON, both thruster and rudder are used for steering. If the boat speed exceeds 6 knots, the thruster steering is automatically disabled.

Source Select

Provides you with automatic or manual selection of interfaced data sources for heading (Compass), Navigation, Position, Wind Angle, Calculated Wind, Water speed, Water temperature, Distance log (not displayed on AP26 and AP27) and Depth.

Wind-C (calculated) is a common term for true wind and wind direction.

Auto source update

Is used for automatically update of sources if the interfaced units have been removed/added or switched on/off.

Select Auto source update by rotating the course knob. Make sure all interfaced units are powered on

The autopilot will search for new connected sources, and replace sources no longer available. “SEARCHING” is flashing as long as the autopilot is searching. When the automatic update is finished, the display will read “DONE”.

Press the STBD button to leave the User setup.

Manual source select

Step through the list of sources using the **PORT** or **STBD** button. Select wanted source by rotating the course knob.

– – indicates that no source is supplying the data available.

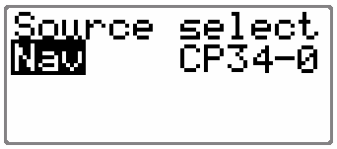
Notes !

1. *Simrad products will be identified by the product name provided the data is available on SimNet. If speed data is provided from the Volvo IPS system to the autopilot computer, the display will read IPS.*
2. *See note on page 69 and note 3 below.*
3. *In the event the SimNet is not powered on, sources supplying data to SimNet are not on or malfunctioning, or there is no SimNet installed, it is possible to use any control unit in the system to select IPS as speed source. The source select displays are then available on all control units.*

Compass

Select the compass to be used if more than one compass is connected.

Note! *Compass can only be selected in STBY mode*



NAV source

Select a source for NAV mode steering.

Position

Select the source for position data.

Wind Angle

Select the source for Wind Angle.

Wind Calculated

Select the source for Calculated Wind data for the Simrad group. The autopilot uses internal sources irrespective of the selected source.

Water Speed

Select the source for water speed (normally the same as the source providing Log data).

Water temperature

Select the source for water temperature (normally the same as the source providing depth data).

DisLog

Select the Log source.

Depth

Select the source for depth data.

Course Adjust

When using the ⇦ (**PORT**) or ⇨ (**STBD**) buttons in AUTO mode, you are changing the set course in 1° increments. If you prefer the increments to be 10° each press, proceed as follows:

Select ***Course adjust*** and turn the course knob to change the setting. The default value is 1°, which is the preferred setting. Select 10° if you want to make major course changes in 10° increments with the buttons and fine-tune the set course with the course knob.

Turn Pattern Select

Select the turn pattern(s) to be available under the **TURN/DODGE/INFO** button. U-turn is always available. Step through the list of turn patterns by using the **PORT** or **STBD** button. Select the wanted pattern by rotating the course knob to fill the squares.

Available turn patterns are: U-turn, C-turn, Spiral, Zigzag, Square, Lazy S, Depth (contour).

Instrument Select

Select the contents of the instrument page(s) to be available under the **TURN/DODGE/INFO** button (page 48). Step through the list of instrument pages by using the **PORT** or **STBD** button. Select the wanted information by rotating the course knob to fill the squares.

Contrast

The contrast of the display may be adjusted to 10 levels (10 = highest contrast). The setting is stored when the system is turned off.

Adjustment is local to the control unit you adjust. At high temperatures, not all levels are available due to automatic temperature compensation.

Press the STBY button to leave the User setup.

AUTO Mode

Settings that are added for the AUTO mode are shown below. Other relevant settings are described under STANDBY mode in this chapter.

Response

The Autotune function in the AP26 and AP27 is so refined that 80-85 % of the boats will need no further adjustments of the steering parameters. On some boats, however, or at particular sea conditions a fine tuning of the steering parameters may improve the performance of the autopilot.

The Response control allows you to make this fine tuning. It can be set to seven levels. Level 3 (default) has the values of *Rudder* and *Counter Rudder* parameters set by the Autotune function. If no Autotune is made (not recommended) the level 3 values are the factory default values.

A low response level reduces the rudder activity and provides a more “loose” steering.

A high response level increases the rudder activity and provides a more “tight” steering.

A too high response level will make the boat start S-ing.

Range: 1 – 7

Default: 3

NAV WIND setting, see page 42.

Thruster sensivity

(only available if a thruster is connected).

The Thruster sensitivity determines how many degrees the vessel will deviate from the set course before a thruster command is given. As the vessel deviates from its heading, the thruster will push the vessel back on. A higher value will reduce the thruster activity.

If the thruster commands are hunting from side to side, the set value for **Thruster sens** may be too low.

Range: 3° to 30° in 1° increments.

Default: 5°.

Seastate filter

OFF: Seastate filter is disabled.

AUTO: Automatically reduces rudder activity and autopilot sensitivity in rough weather by an adaptive process (default).

MANUAL: Manual yaw band adjust (1-10, 10 ≈ ±6°).

The manual setting determines the number of degrees the vessel may deviate from the set course before any command is given to the rudder. The AUTO setting is recommended. The MANUAL settings may be used to find the optimum combination of course keeping and low rudder activity in rough but steady sea conditions.

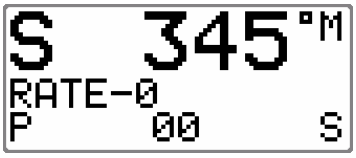
NAV Mode

The User setup for NAV mode is similar to the User setup for AUTO mode. It does, however, not include the Nav/Wind and the Source select items.

2.20 INFO menu

A number of instrument pages are available under each mode screen if the required NMEA 0183 sentences are provided (see paragraph 8.1) or the information is available on SimNet (page 89). The INFO menu is accessed by a long press on the **TURN/DODGE/INFO** button.

The main (mode) screens for Standby, Auto and Nav modes have an alternative screen available in the INFO menu.



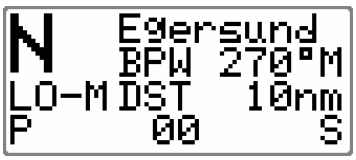
Standby mode

The main screen shows current heading, heading source and rudder angle.

A long press on the **TURN/DODGE/ INFO** button gives you an alternative mode screen which shows current heading with large figures. You have to select this screen from the pages in the INFO menu.

Auto mode

As for Standby mode you can have an alternative Auto mode screen. It shows the set course with large figures after a long press on the **TURN/DODGE/INFO** button. As for the STBY mode you have to select this screen from the INFO menu.



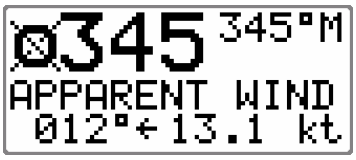
Nav mode

For Nav mode the alternative mode screen gives you the name of the waypoint, bearing and distance to waypoint and rudder angle. This screen is also among the INFO pages.

Step or scroll through the available instrument screens by pressing the **PORT** or **STBD** button or using the course knob.

Compass
Heading source
Heading
Rudder angle

Depth/Speed
Depth
Speed



Apparent wind
Apparent wind angle
Apparent wind speed

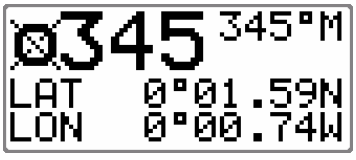
True wind
True wind angle
True wind speed

True wind
True wind angle
VMG to wind

Wind direction
Wind direction
Wind speed

Wind shift
Wind direction
Wind shift

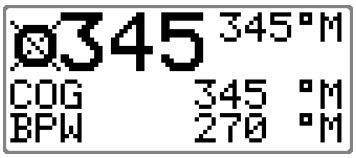
Track data
Cross Track Error
Distance to Waypoint



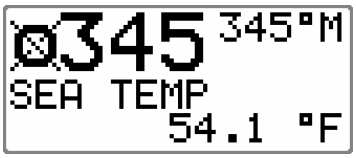
Position
Latitude
Longitude

Nav data
Waypoint ID
Bearing Position – Waypoint

Nav data
Course Over Ground
Speed over ground



Nav data
Course Over Ground
Bearing Position – Waypoint



Sea Temperature

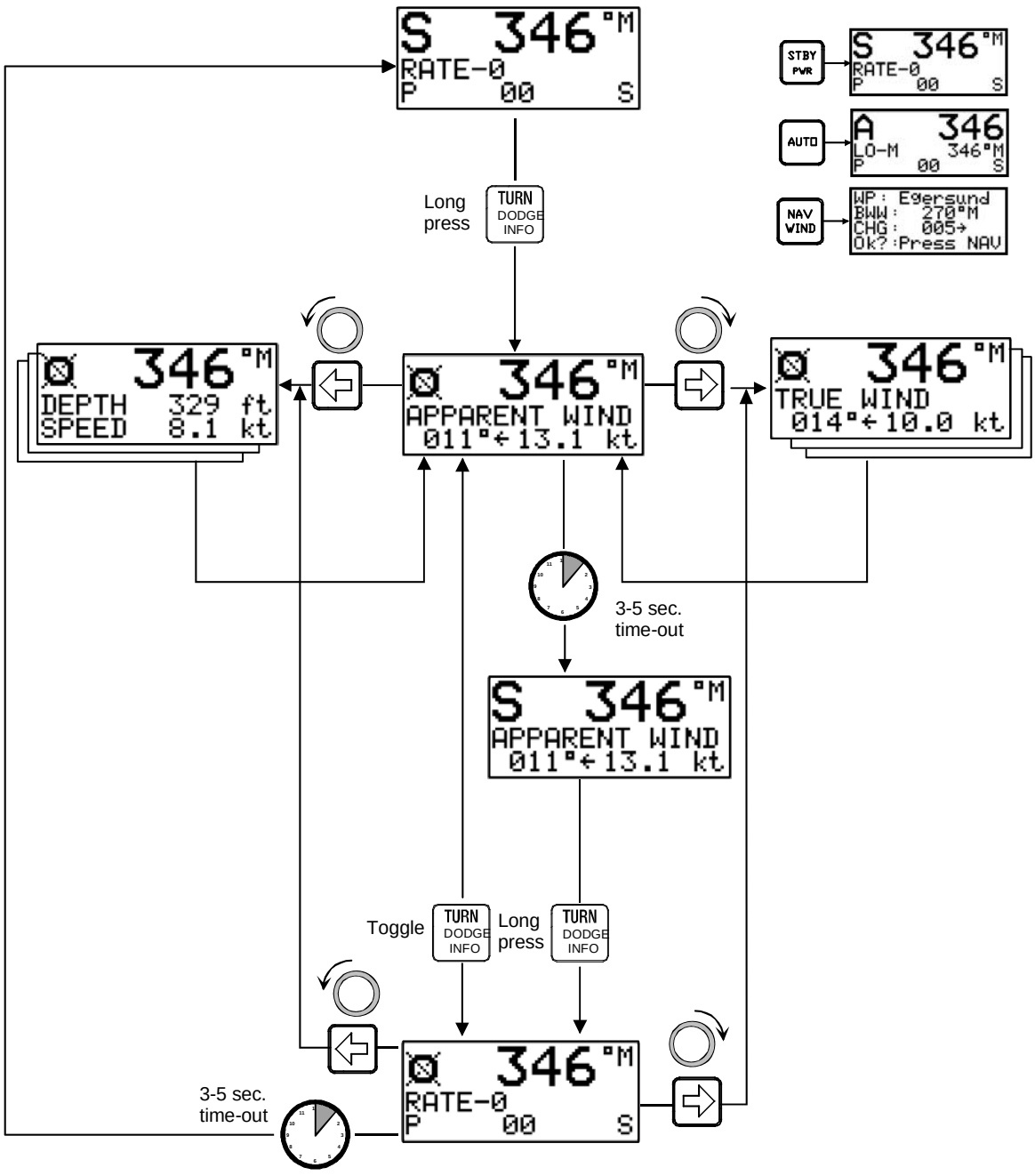
If you prefer not to have all the instrument pages available in the INFO menu, you may remove pages under the User setup menu. See page 45.

Return to last instrument screen by a long press on the **TURN/DODGE/INFO** button.

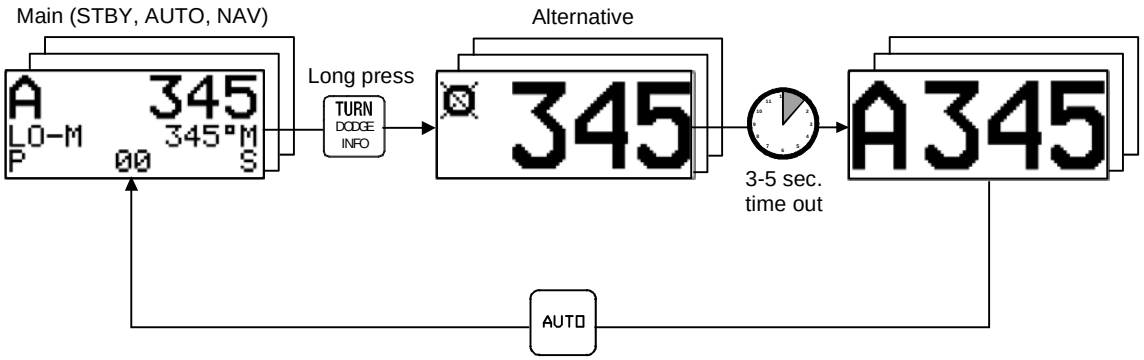
Course knob icon

Initially when the INFO menu is accessed an icon will replace the mode index to tell that no course changes or other course related settings can be made unless you press a mode key. The icon will time out after 3-5 seconds and be replaced by the mode index.

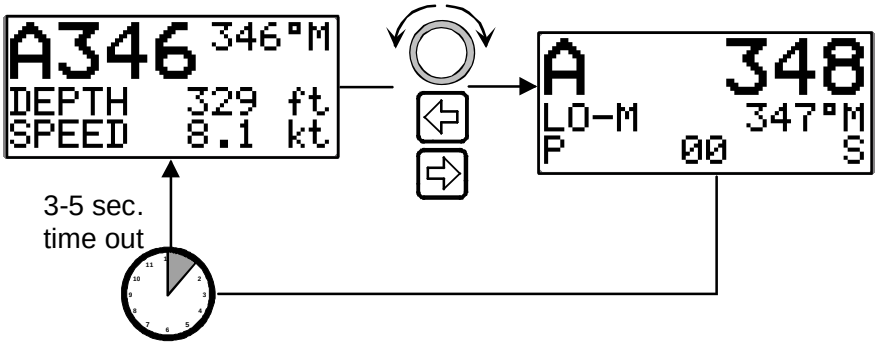
INFO menu flowchart



Alternative mode screens in STBY, AUTO and NAV

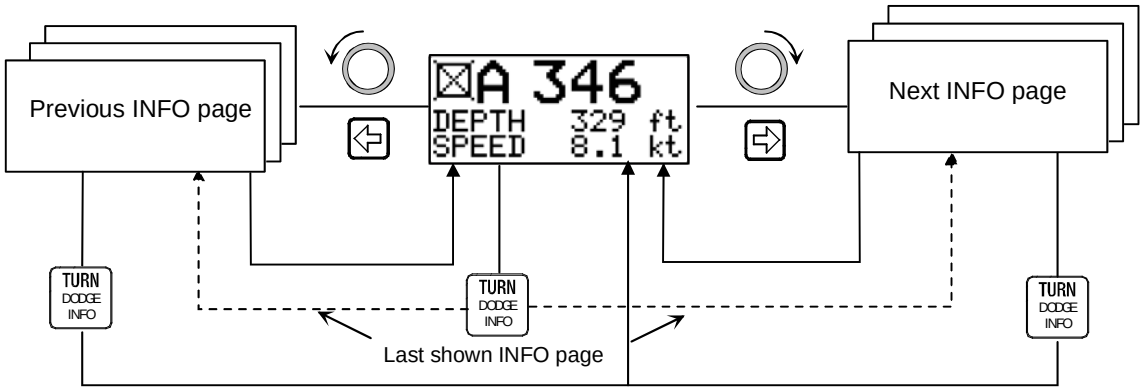


INFO menu and Main screen, active unit



Note ! *Whenever the INFO menu is active and the mode index is present on an active unit, operating the PORT and STBD button or the course knob will immediately make the main screen reappear.*

INFO menu and Main Screen, inactive unit



You can view the INFO pages without activating the unit.

3 INSTALLATION

3.1 General

This section provides detailed information required to successfully installing the AP26 and AP27 Autopilot system.

A basic autopilot systems include only three modules that need to be mounted in different locations on the boat, and also need to interface with at least three different systems on the boat:

- The Volvo IPS system
- The boats electrical system (input power)
- Other equipment on board (GPS/Chartplotter)

In addition, the advanced capabilities of the autopilot require the installer to perform a series of settings and tests to verify proper operation of the system, refer to the check list below.

3.2 Installation checklist

1. Determine the system configuration you are installing (Figure 3-1)
2. Perform the hardware installation (Page 55)
3. Connect SimNet devices to SimNet (page 64)
4. Connect NMEA2000 devices (page 67)
5. Connect NMEA 0183 devices via AT10
6. Perform Set-up (Section 4, page 71)
7. Perform dockside autopilot tests (refer to Operating Instructions, page 15)
   a) Test all stations (if applicable) - lock/unlock - active/ inactive
   b) Test Non-Follow Up mode
   c) Test Follow-Up mode
   d) Test AUTO mode
   e) Test NoDrift mode
   f) Test NAV mode and input interfaces
   g) Test interface outputs to external equipment (if connected)
8. Perform sea trial settings (Page 76)
   a) Rudder zero
   b) Compass calibration
   c) Compass Offset adjustment

d) Automatic tuning
e) Viewing parameters

9. Test Autopilot Operation at Sea (refer to Sea Trial instructions, pages 76, 91)
10. Provide the user with training (Page 91)

3.3 Unpacking and handling

Care should be taken when unpacking and handling the equipment. A visual inspection should be made to see that the equipment has not been damaged during shipment and that all components and parts are present according to the packing list.

An autopilot system for Volvo Penta IPS will include:

- Control unit with standard installation accessories.
- AC05 Autopilot computer and one 10 m (33') Robnet2 cable.
- Interconnection cable to Volvo IPS 1 m (3’)
- RC36 Rate Compass with 15 m (49') cable attached.
- Three autopilot manuals (use the AP26/AP27 manual)
- Optional equipment that may have been ordered for the installation.

3.4 Determine system configuration

It is important to become familiar with the configuration of the system prior to beginning the installation. The autopilot system layout with options is shown in Figure 3-1.

As many of the units are communicating on a common network (Robnet2), with identical connectors, the installation is simplified. Try to mount the units within the standard cable length supplied with each unit, if possible. Robnet2 Extension Cables (1, 5 and 10m) and Robnet2 T-Joiner are available from your Simrad dealer.

3.5 Autopilot System Layout

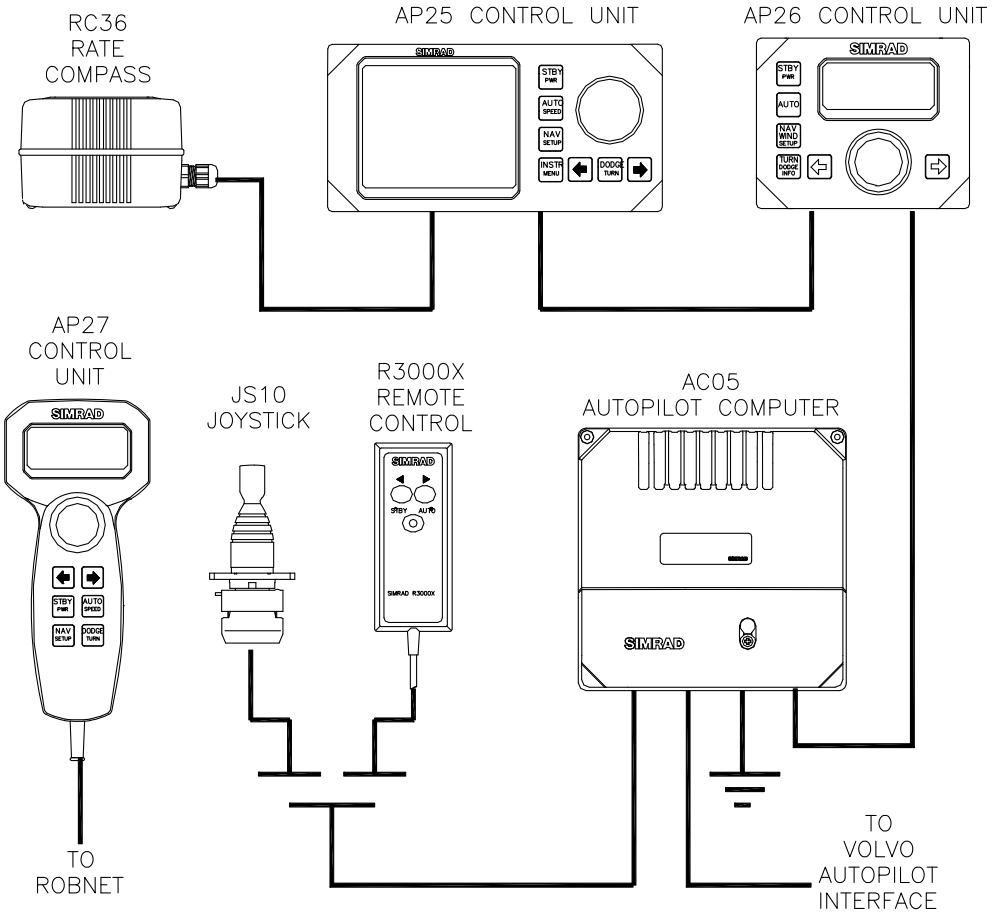


Figure 3-1 Autopilot system layout with options

3.6 Autopilot computer installation

The autopilot computer is designed to operate in a location with ambient temperatures below +55°C (+130°F).

It must be mounted close to the Volvo Autopilot Interface within the length of the interconnection cable, 1 m (3’). See Figure 3-7.

Note ! *The AC05 Autopilot Computer is not weatherproof and should be mounted vertically in a dry environment.*

Cable connections

Use only shielded cables, also for the Mains input. Signal cables should be 0.5 mm^2 (AWG20) twisted pairs.

The mains supply cable should have sufficient wire gauge; minimum 1,5 mm^2 (AWG14).

Grounding and RFI

The autopilot system has excellent RFI protection. The autopilot computer should have a proper ground connection to the hull/bonding system.

RobNet2 cables and other signal cables (Volvo IPS) should not be run in parallel with other cables carrying RF or high current, such as VHF and SSB transmitters, battery chargers/ generators, winches and thrusters.

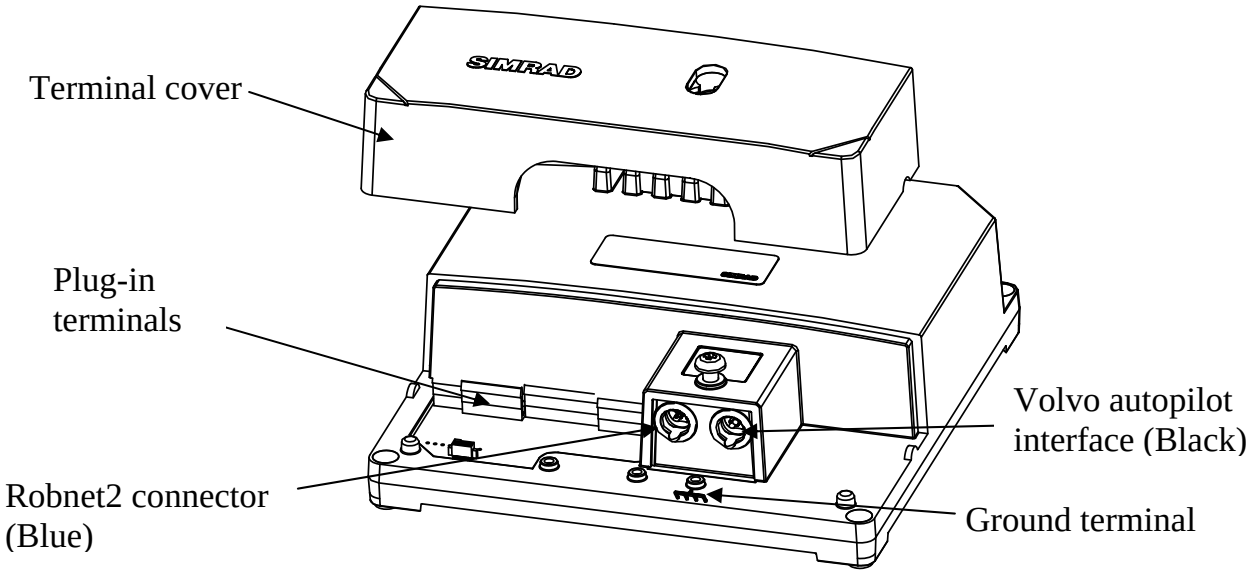


Figure 3-2 AC05 Autopilot Computer

Remove the terminal cover to get access to the plug-in terminals.

Provide sufficient wire length so that the plug-in terminals can be easily connected/disconnected.

Pull out each terminal before connecting the wires. Remove all strands before putting on the terminal cover.

Caution ! ***Do not mix the (blue) Robnet cable with the (black) Volvo IPS cable.***

Cable strain relief

Once all the cables have been run to the appropriate peripherals and connected to the autopilot computer unit they should be secured to ensure that they are not snagged or exposed to excess strain.

Screw the strain relief tab to the cable exit port on the autopilot computer unit using the screws supplied and secure the cables to the tab using the wraps as shown.

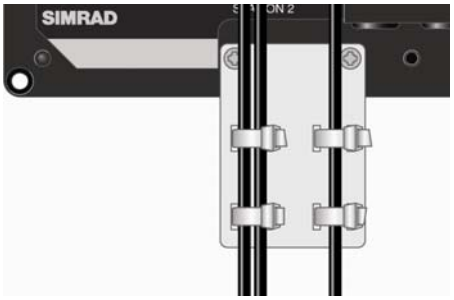


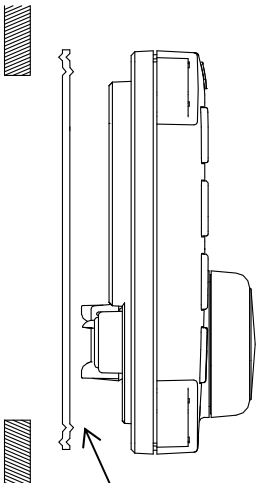
Figure 3-3 Cable strain relief

3.7 Control unit installation

Avoid mounting the control unit(s) where it is easily exposed to sunlight, as this will shorten the lifetime of the display. If this is not possible, make sure the units are always covered with the white protection cover when not used.

Caution ! ***Do not install the control unit where moisture at the rear can be present. It could cause damage by entering the breathing hole or by coming into contact with the electrical connectors.***

Panel mounting of AP26

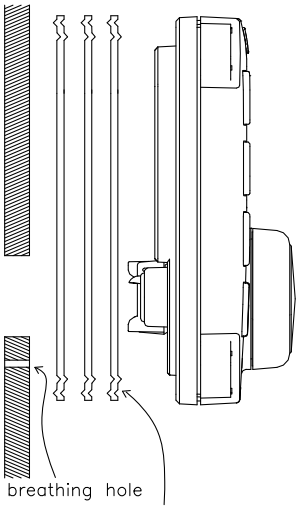


This side towards control unit

The mounting surface must be flat and even to within 0.5 mm.

- Drill the 4 mounting holes and make a panel cut-out according to supplied template.
- Place one of the three supplied gaskets between the panel and the unit with the interlocking feature correctly orientated (see figure).
- Use the supplied screws to fasten the control unit to the panel. **Do not over-tighten the mounting screws!**
- Apply the front panel corners.
- Connect the Robnet2 cable(s) to the control unit connector(s)

Alternative panel mounting of AP26



This side towards control unit

This way of mounting is simpler, but will lift the unit from the panel surface. When installed adjacent to Simrad equipment there will be a difference in height between the autopilot and the other equipment.

- Use the template and drill hole(s) only for the connectors.
- Place all three gaskets between panel and unit with the interlocking feature correctly orientated (see figure).
- Follow above panel mounting instructions but use the supplied 32 mm screws to fasten the control unit to the panel

Do not over-tighten the mounting screws!

Optional bracket mounting

- Locate the cradle on the mounting site and mark the 4 holes for the fixing screws on the mounting surface.
- Drill the 4 mounting holes and screw the cradle to the mounting surface.
- Use the supplied screws to fasten the control unit to the left and right brackets.
- Apply the front panel corners.
- Use the two locking knobs to assemble the cradle with the left and right brackets and adjust the control head to best viewing angle.
- Connect the Robnet2 cable(s) to the control unit connector(s) **(See note on page 60).**

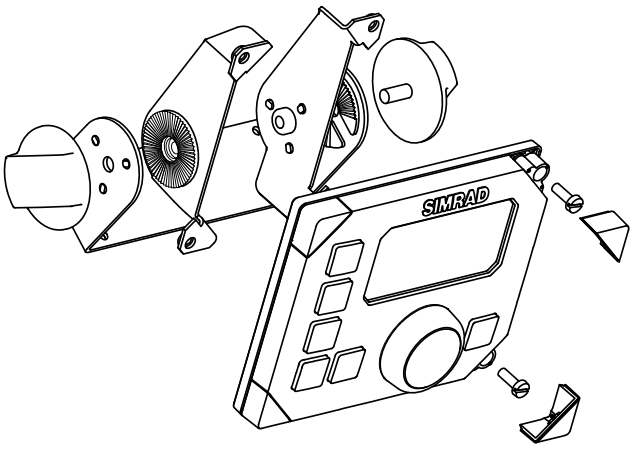


Figure 3-4 AP26 Bracket mounting

3.8 ROBNET2 network cables

As Robnet2 units have two Robnet2 connectors (blue) they can be used as "jack points" for further expansion of the system. There are no dedicated "in" or "out" connectors. You may connect the cables to any available Robnet2 connector (blue) on the specific unit. The Robnet2 connectors have a locking mechanism for extra safety.

Caution ! ***Do not mix the blue Robnet2 cables with the yellow SimNet cables.***

The 10 m cable to the autopilot computer has a connector at both ends. Robnet2 cables with 5 pin male connector at both ends are

available in 1, 5 and 10 m length. For cable extension a Robnet2 T-Joiner is required.

When installing a system, try to minimize the total cable length by connecting all Robnet2 units to the nearest available Robnet2 connector.

Total length of Robnet2 cable installed in a system should not exceed 50 m (165').

Examples of interconnecting Robnet2 units:

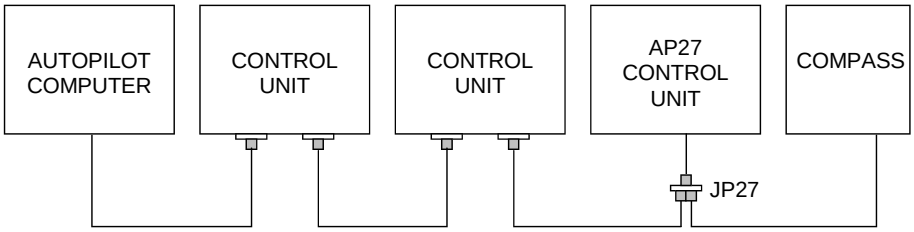


Figure 3-5 Interconnecting Robnet2 units

A Robnet2 T-Joiner P/N 24005662 is available to make the Robnet2 interconnection more simple by reducing the number of cables or extend cables when necessary.

See table for pin configuration and color code of the network cable.

Cable pairs	Color code	Signal
1. pair	Pink	V SYSTEM+
	Grey	V SYSTEM–
2. pair	Brown	Bus–
	White	Bus+
	Yellow	On - Off

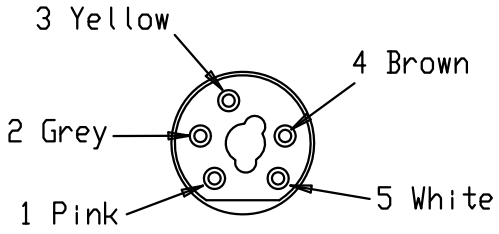


Figure 3-6 Robnet2 Connector

Note ! *The connectors are weather proof according to IP65, when properly installed. All unused Robnet2 connectors must be fitted with the plastic cap to protect them against dirt and moisture.*

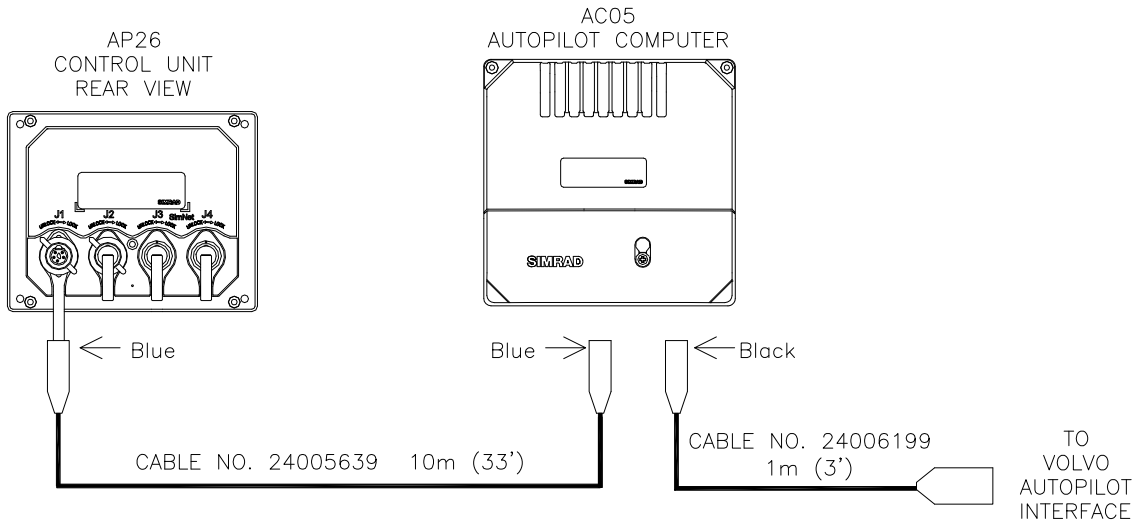


Figure 3-7 AP26 Control unit connection

J1 and J2 (left) are Robnet2 connectors. J3 and J4 are SimNet connectors.

Note ! *The Volvo Autopilot Interface is the gateway between the autopilot and the IPS system. The gateway kit must be ordered from Volvo under P/N 3819744.*

AP27 connection

If a Simrad AP27 is part of the system, use the JP27 Jack Point and connect as shown on Figure 3-5 and Figure 1-2.

Note ! *The AP27 cable contains an air-breathing tube. Check that the cable runs free to avoid blocking of the tube.*

3.9 RC36 Rate Compass installation

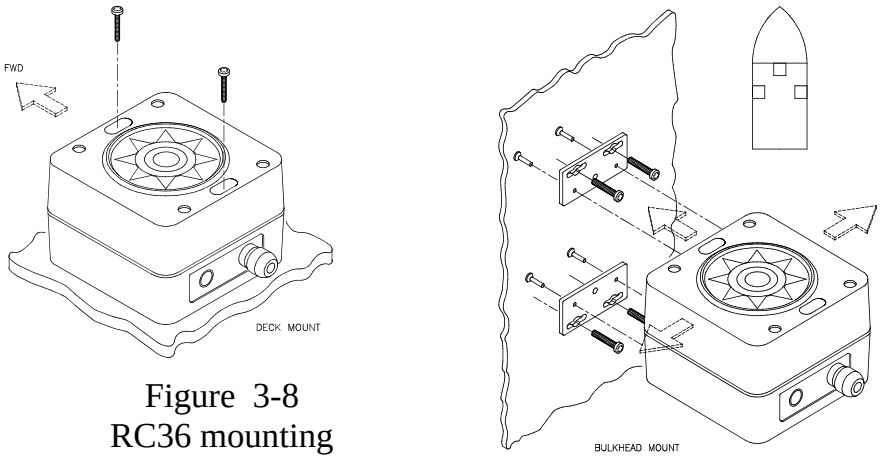


Figure 3-8
RC36 mounting

The heading sensor is the most important part of the autopilot system and great care should be taken when deciding the mounting location. As the heading is displayed on the Control Unit, the heading sensor can be mounted at a remote location.

The RC36 rate compass also contains a magnetic heading sensor, so particular attention must be paid to the location. It can be mounted on deck or bulkhead, athwartship or alongship and has a 15 m (99') cable with a Robnet2 connector. The heading offset feature in the autopilot will compensate for the mechanical offsets that may be a result of the selected location and orientation of the RC36.

If the RC36 is deck or bulkhead mounted athwartship with the cable gland pointing aft, little if any offset correction is required. With the cable gland pointing forward a 180° correction is required.

When mounting RC36 on a bulkhead alongship, a +90° or –90° correction is needed dependent on whether it is port or starboard bulkhead.

Note ! *Offset correction is performed after the calibration (see paragraph 4.6).*

Find a location that provides a solid mounting place free from vibration, and as close to the vessel's centre of roll and pitch as possible, i.e. close to the water line. It should be as far as possible from disturbing magnetic influences such as the engines (min. 2 meters), engine ignition cables, the IPS drive, other large metal objects and particularly electric bow thrusters and anchor winches and their cables. On steel hull boats it should be mounted 0,75-1 m above the wheel house on a non magnetic stand.

Use the supplied mounting kit and drill the holes through the centre of the slots in the sensor or the mounting brackets.

Note ! *The compass face plate on the RC36 is the TOP. Never mount it upside down! Level the sensor as close to horizontal as possible.*

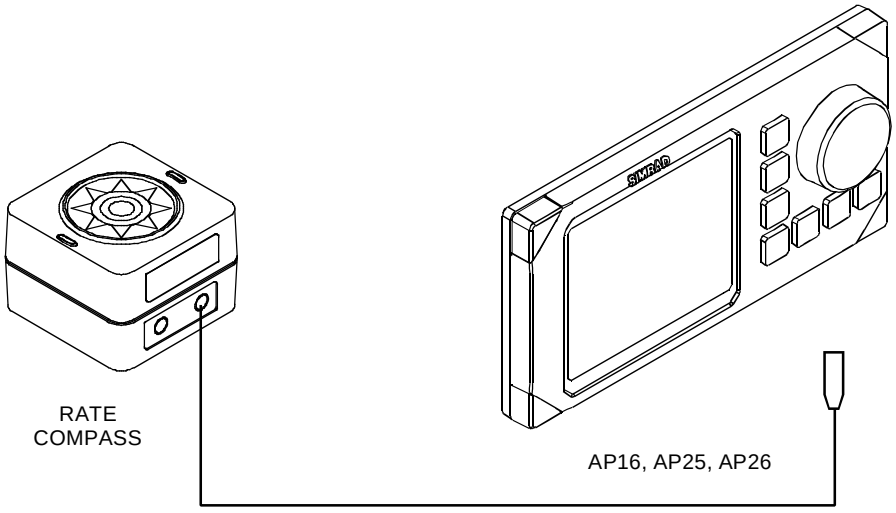


Figure 3-9 RC36 connection to autopilot control unit

Plug the RC36 into a Robnet2 connector (see Figure 3-5).

3.10 R3000X Remote Control installation

R3000X should be mounted in the supplied bracket that can be fixed by four mounting screws. The unit is weather proof and can be mounted outdoor.

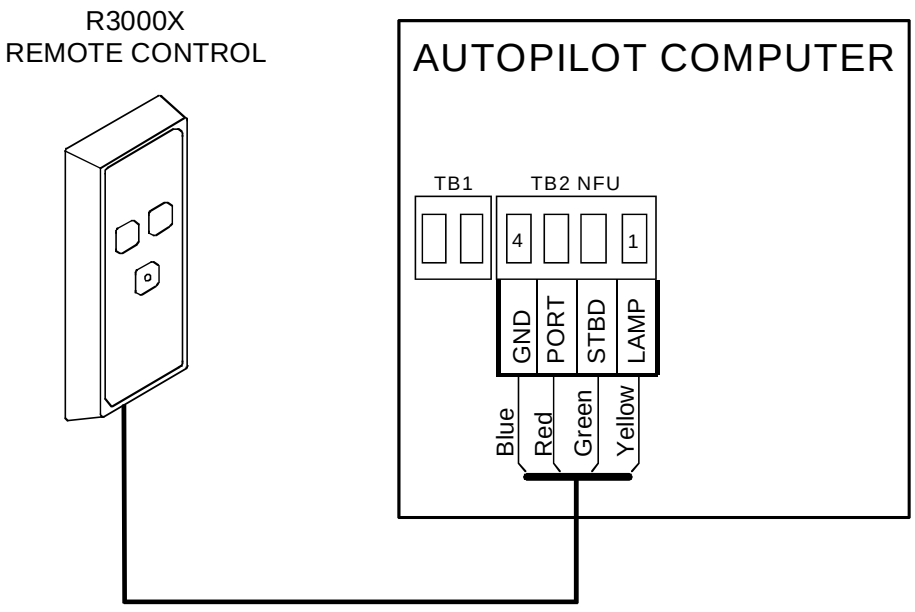


Figure 3-10 R3000X connection

3.11 JS10 Joystick

Refer to separate installation instructions supplied with the JS10 Joystick.

3.12 S35 NFU Lever installation

The unit is mounted to a bulkhead or panel by two screws from the front. The cable is connected to the autopilot computer according to Figure 3-11. Interchange the Port and Stbd wires to the screw terminals if necessary to make the direction of the lever movement coincide with the direction of the rudder movement.

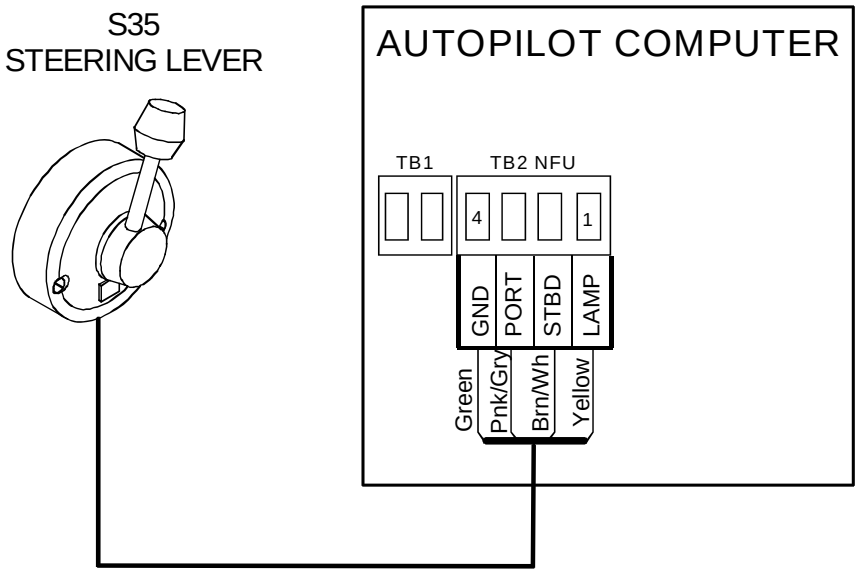


Figure 3-11 S35 connection

The unit is opened by removing the three screws on the back cover. Inside are two sets of micro-switches, a printed circuit board with a plug-in terminal and a jumper strap.

3.13 Interfacing

With the autopilot system there are several possibilities to connect to other equipment for data collection and exchange:

1. Use SimNet
2. Use SimNet via AT10 Universal SimNet/NMEA Converter
3. Connect to a NMEA2000 network via the adapter (drop) cable, part no. 24005729.

4. The AC05 has high speed compass heading output to Simrad and Furuno radars (Clock/Data interface).

The different connecting diagrams on the following pages illustrate the interface possibilities of the autopilots.

3.14 SimNet

The SimNet cable system with very small plugs in both ends makes it easy to run the cables, only 10 mm (3/8”) holes are required through panels and bulkheads. The SimNet accessory program contains the necessary items to make a successful installation.

SimNet network cables

A SimNet unit has one or two yellow SimNet connectors. There are no dedicated “in” or “out” connectors. Find the shortest and easiest way to route the SimNet cables from product to product and select the standard length cables from the SimNet accessory program. SimNet cables are available in 0.3 m (1 ft.), 2 m (6.6 ft.), 5 m (16.6 ft.) and 10 m (33 ft.) length all with plugs at both ends. Connect products with two SimNet connectors in a daisy chain and use drop cable and T-joiner for products with only one SimNet connector.

The SimNet power cable has a red connector with built in terminator.

If you plan to extend your SimNet system in the future it may be an idea to prepare for it by adding a few T-joiners in central locations. The T-joiners provides easy access to the network and can be replaced with a new product, or the new product can be connected via a drop cable.

SimNet power and termination

The following rules should be observed when installing SimNet.

1. SimNet must not be connected to a 24VDC supply.
2. SimNet shall have a separate 12VDC power from the battery bus or the circuit breaker board to avoid interference
3. SimNet shall not be connected to the supply voltage terminals of the Autopilot Computer (introduces interference).

4. SimNet will power an IS12 instrument system. Hence SimNet on other equipment can be connected and powered via IS12.
5. SimNet must be properly terminated.

The SimNet network has to be terminated according to the number and type of products connected.

In a small system consisting of maximum 5 SimNet products and a total length of 5 m SimNet cable you need the SimNet power cable with built in termination (red disc on cable plug).

For additional information about SimNet ask for the separate SimNet Manual.

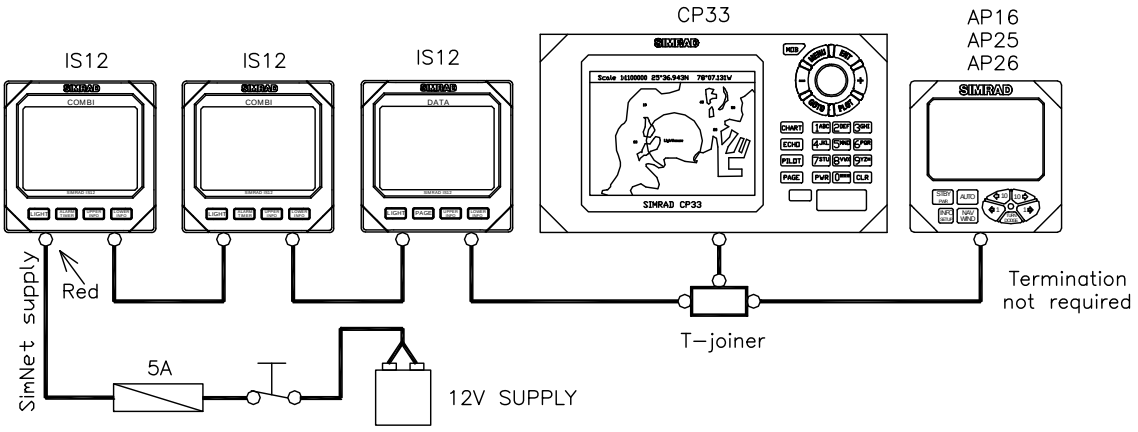


Figure 3-12 SimNet network, small system

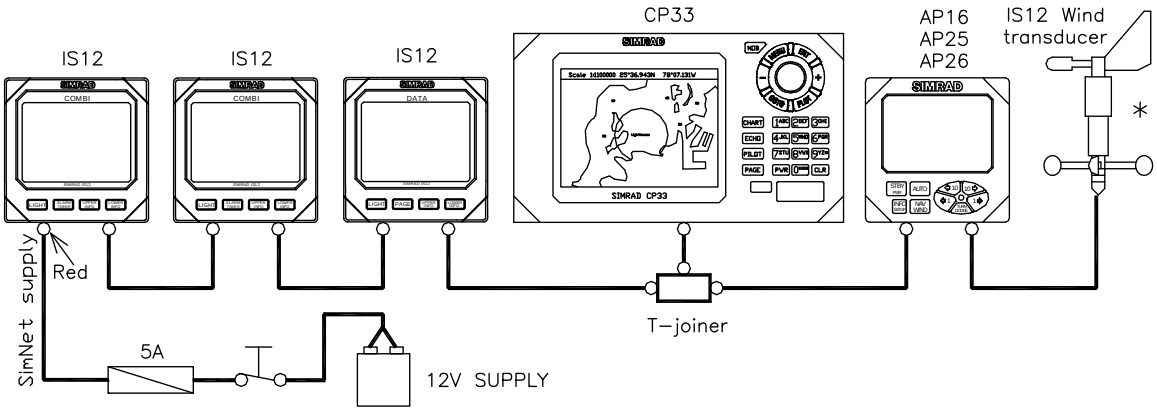


Figure 3-13 SimNet network, small system with Wind transducer

The wind transducer (*) has a built in terminator.

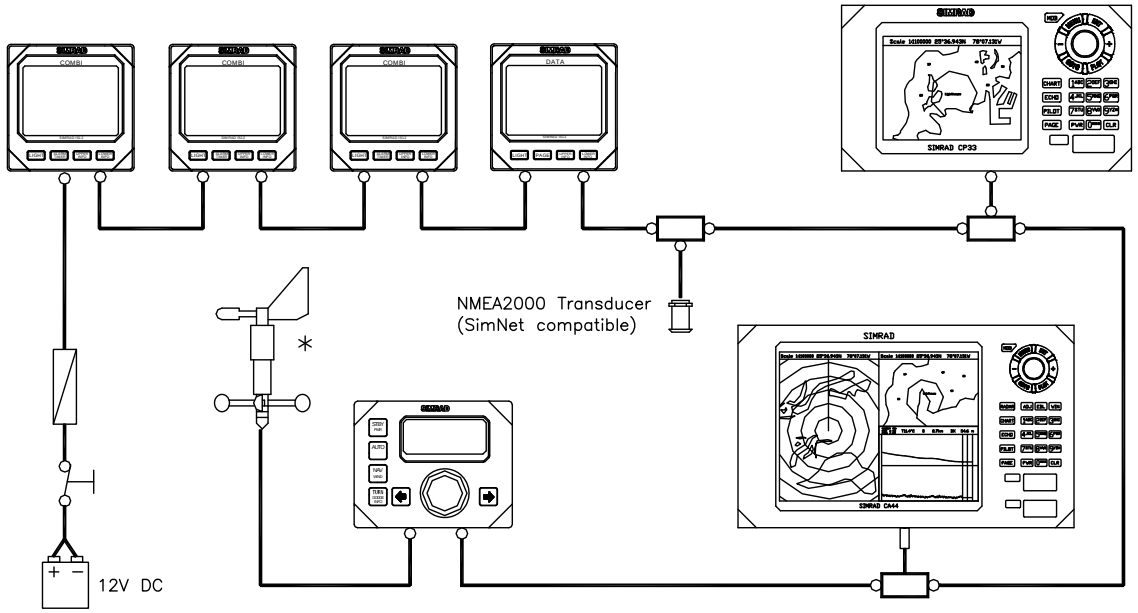


Figure 3-14 SimNet network, medium system

Notes !

1. Maximum total length of SimNet cable is 40 m (130 ft.) excluding the 30 m (99 ft.) of masthead cable.
2. The wind transducer (*) has a built in terminator
3. If there is no wind transducer connected, a SimNet terminator must be connected instead.

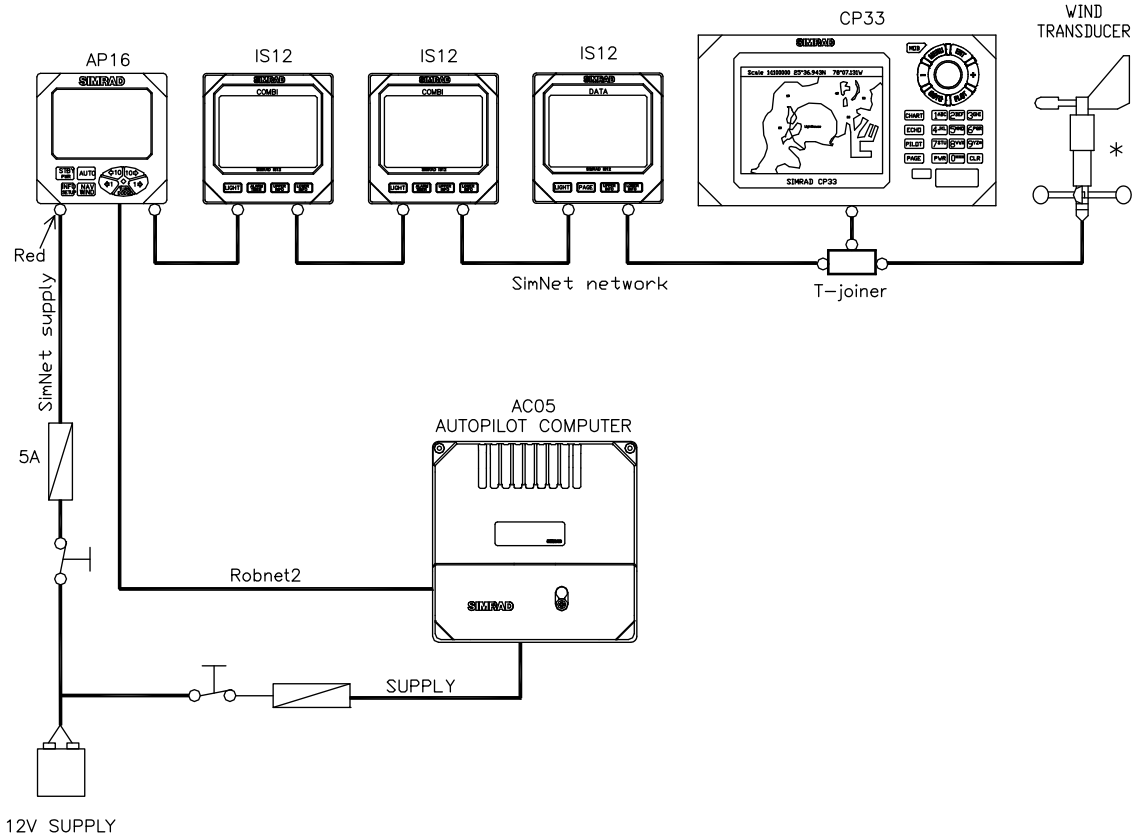


Figure 3-15 Robnet2 and SimNet network

* The wind transducer has a built in terminator

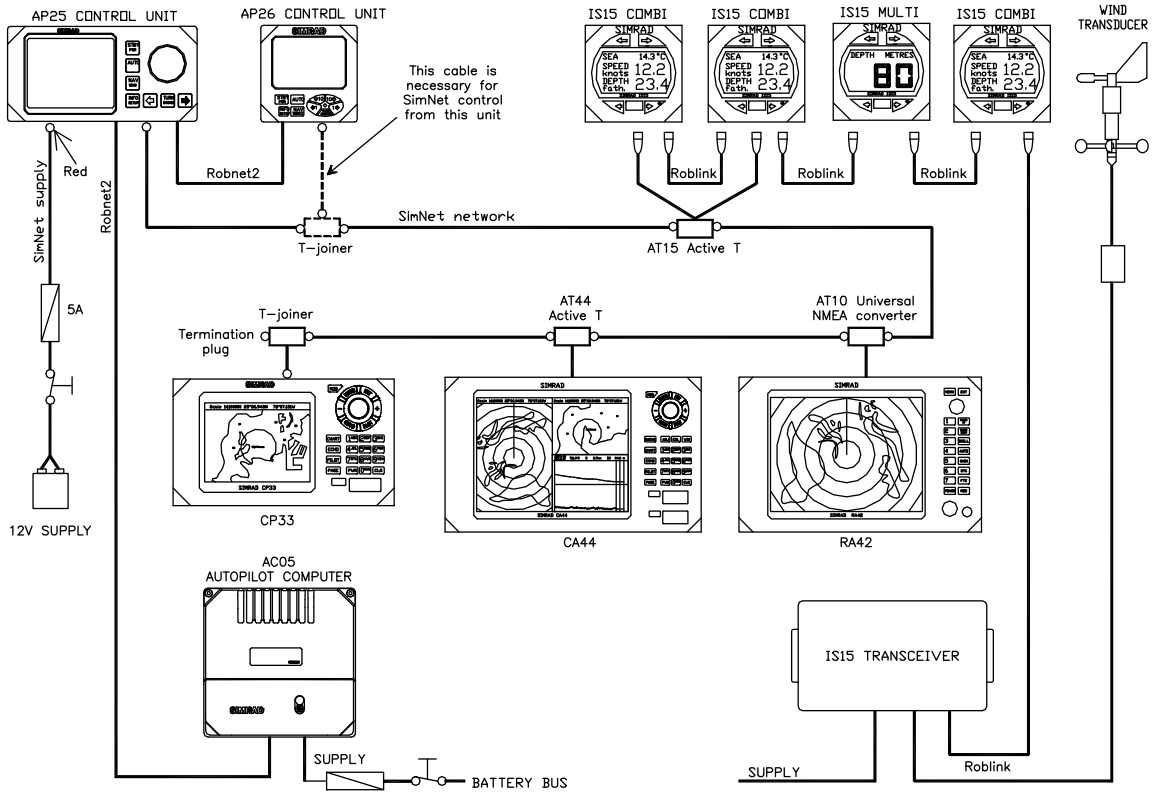


Figure 3-16 Robnet2, SimNet and Roblink network

Notes !

1. Maximum total length of SimNet cable is 60 m (196 ft.) excluding the 30 m (99 ft.) of masthead cable.
2. It is not necessary to connect all autopilot control units to SimNet for data sharing. However, if you want to have full redundancy and SimNet control, e.g. select sources, you have to connect the actual unit to SimNet.
3. AT15 is a NMEA0183/SimNet converter for the IS15 Instrument system. IS15 makes no load on SimNet.
4. AT44 is a SimNet interface that is supplied with CX44 and CX54.

3.15 Radar Clock / Data Heading Output

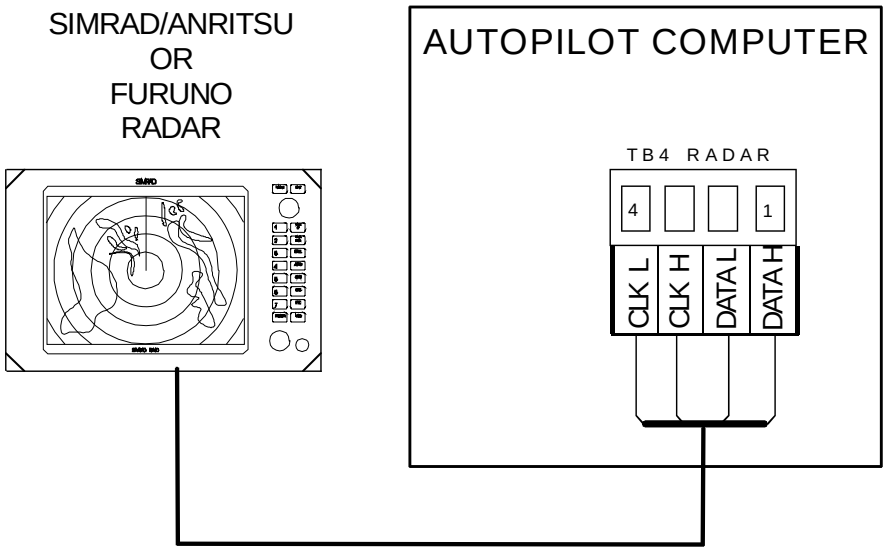


Figure 3-17 Radar Clock/Data connection

3.16 IS15 Instrument installation

For installation and operation of the IS15 instruments refer to separate manuals. For interfacing the IS15, you need the dedicated AT15 Active Tee as an interface item (page 69, 102).

3.17 External Alarm

The external alarm circuit has an open collector output for an external alarm relay. The operating voltage for the circuit is an internal AC05 voltage. Max. load on the alarm voltage is 125 mA.

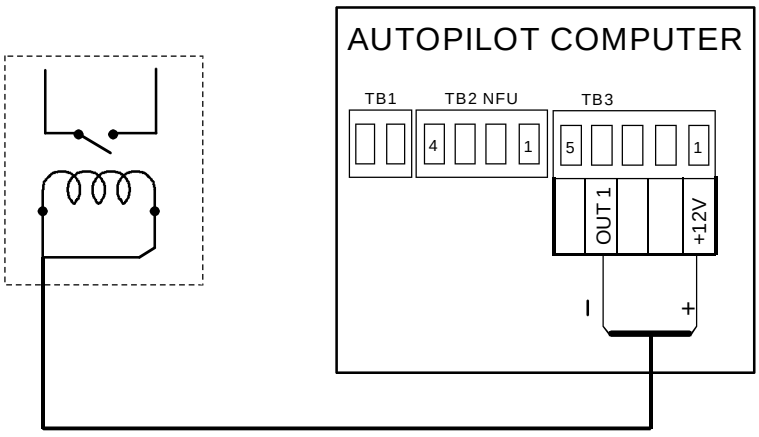


Figure 3-18 External alarm connection

4 CONFIGURATION AND SETUP

4.1 First time turn on

Before attempting to turn on the autopilot and perform an Installation Setup, the hardware installation and electrical connections must be completed in accordance with the installation instructions.

The design of the autopilot includes advanced features that have simplified the installation and setup of an autopilot.

This is the start-up screen that is presented the first time you turn on your autopilot by pressing the **STBY/PWR** button.

Notes !

1. *You can postpone the automatic interface by going directly to the Installation/Dockside setup. Any time the STBY button is pressed the interface prompt will reappear until the automatic interface has been performed.*
2. *Be aware that you will have no compass reading before the automatic interface is completed.*

Continue by pressing the **STBD** (START) button to start the automatic interface.

The autopilot will search for connected sources, and as the sources are detected a black square appears on the screen.

"SEARCHING" is flashing as long as the autopilot is searching for data. When the automatic interface setup is finished, "Done press →" is displayed. Press the **STBD** button to accept. The display will read "SETUP REQUIRED".

Continue with the installation setup according to the next chapters.

If you already have completed the installation settings, the autopilot will enter STBY mode.

4.2 Description of Installation Settings

Note ! *The installation settings must be performed as part of the installation of the autopilot system. Failure to do so correctly may prohibit the autopilot from functioning properly!*

The Installation menu can only be accessed in STBY mode.

The Installation Settings are grouped into the following functional categories:

- Language: Selection of language used for display information
- Interface: Setting the format of the clock/data heading output for radars connected to the Autopilot Computer.
- Display units: Setting the units to be displayed for wind speed, water temperature and depth.
- Seatrial: Presents settings and automatic calibrations to be performed during sea trial.
- Parameters: Permits viewing and changing of basic steering parameters (See also response control page 46).
- Service: System data, SimNet setup, Master reset of memories.

Each group is designed to focus on specific functions and enable quick access when changes need to be made.

Some important points regarding the installation settings:

- When the autopilot is delivered new from the factory AND ANY TIME AFTER A MASTER RESET OF MEMORIES HAS BEEN PERFORMED, the installation settings are all reset to factory preset (default) values. The automatic interface prompt will appear (see page 71) and a complete setup has to be made.
- The values that are selected from within the Installation Settings Menu, are stored in the memory of the autopilot system. No specific action is required to "SAVE" the selected values. Once the value is changed, it is stored until the next time the menu item is selected and changed.

- The Installation Settings are global except for display units and language, enabling settings to be distributed to all control units in the system.

4.3 Installation Menu

The Installation Menu is presented on the autopilot display by pressing and holding the **NAV/WIND/SETUP** button for 5 seconds.

Note ! *The INSTALLATION MENU is different from the USER SETUP MENU. Refer to the flow diagram on the next page for a pictorial view of the Installation Menu.*

Navigate through the Installation Menu as follows:

- Answer YES to a question by rotating the course knob clockwise.
- Answer NO to a question or proceed to the next menu item by pressing the **STBD** button.
- Return to the previous menu item by pressing the **PORT** button.
- Change the selected item by rotating the course knob in either direction.
- Exit the Installation Menu by pressing **STBY**, **AUTO**, or **NAV WIND** buttons.

When using the Installation Menu, refer to the diagram "Installation Menu Flow Chart" on next page.

Note ! *You may proceed through all items in the installation menu by continuing pressing the STBD button.*

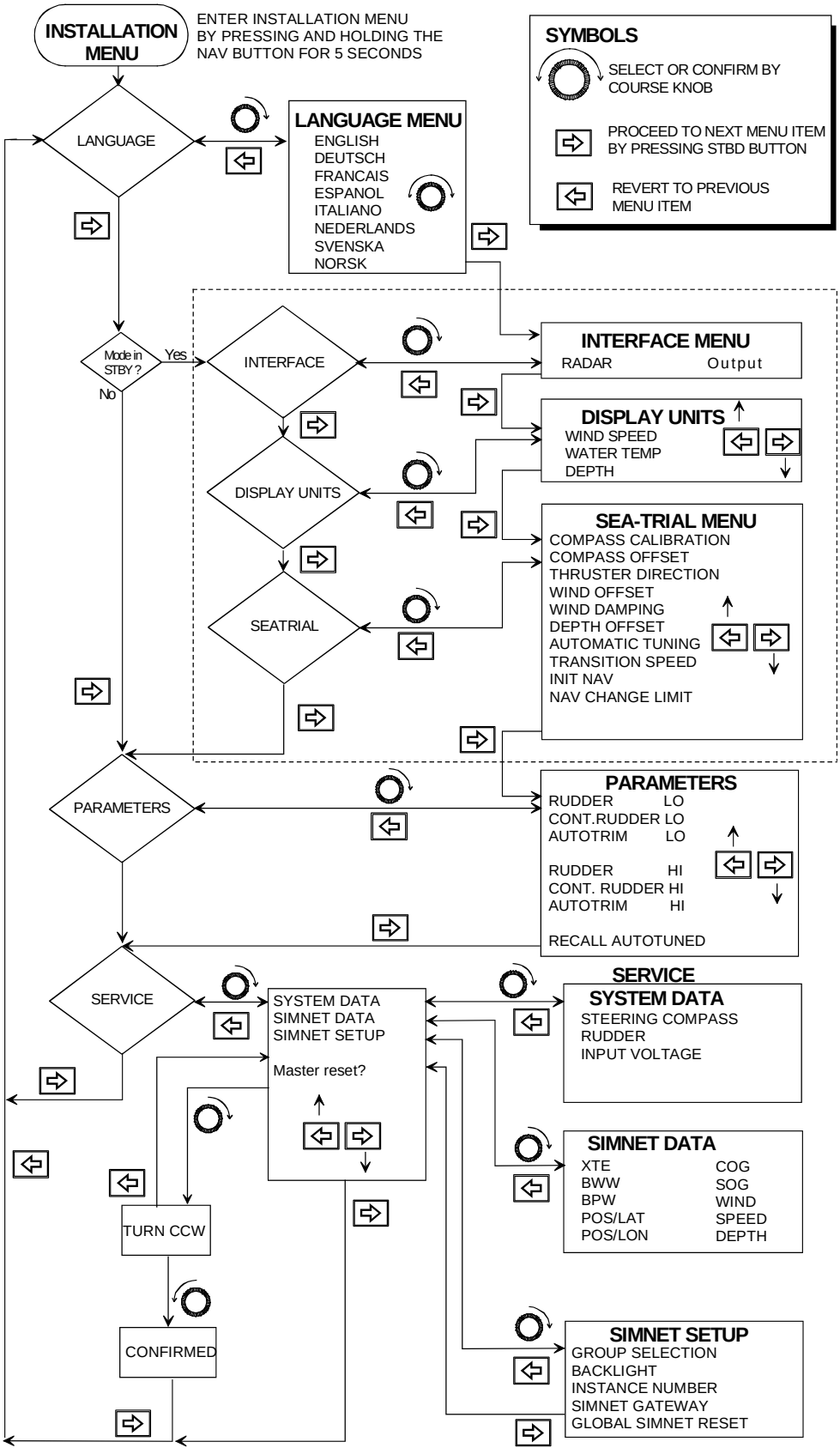


Figure 4-1 Installation Menu Flow Chart

Language selection

To access the language selection in the Installation Menu, confirm “Yes” by turning the course knob clockwise

The autopilot can present the display text in eight different languages:

English, Deutsch, Francais, Espanol, Italiano, Nederlands, Svenska and Norsk.

Turn the course knob to select the language you wish to use.

Continue to next item in the menu by pressing the **STBD** button, or leave the menu by pressing the **STBY** button.

4.4 Interface Settings

Sets the format of the clock/data output for radars connected to the Autopilot Computer.

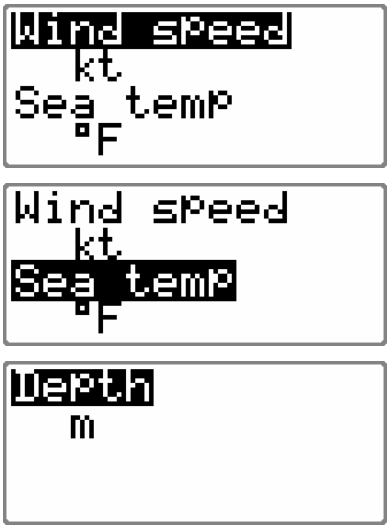
Step to the Interface part of the Installation Menu.

Turn the course knob clockwise to access the Interface Setup items.

Use the course knob to select the connected type of radar.

4.5 Display units

Select *Display units* by pressing **STBD** button and confirm by rotating the course knob clockwise. This screen gives access to the display unit set-up of the *Wind Speed*, *Sea temperature* and *Depth*. The setup is local to each control unit.



Use the **STBD** button to select an item and the course knob to select the unit.

Available units are:

Wind Speed: Knots (kt) or meter/second (m/s)

Sea temperature:
Fahrenheit (°F) or Celsius (°C)

Depth: Meter (m) or feet (ft)

Exit the Display units menu by pressing **STBD** button to proceed to the Sea trial menu, or press **STBY** to return to normal autopilot operation.

4.6 Sea Trial

WARNING ! The Sea Trial must always be performed in open waters at a safe distance from other traffic.

The seatrial settings are:

- Rudder zero adjust (To tell the autopilot the precise midships position of the rudder)
- Minimum rudder
- Compass calibration (To automatically compensate for onboard magnetic interference)
- Compass Offset (To compensate for a fixed offset (A-error) in the final compass heading readout)
- Wind Offset (To compensate for a fixed mechanical offset of the Wind vane if installed)
- Wind Damping (To avoid flickering on the wind display)
- Depth offset (To compensate for the distance between the depth transducer and the surface if required)
- Automatic tuning (A method of determining the steering parameters)
- Transition speed (the boat speed at which you want to automatically change steering parameters)

- Init NAV (to set the response you prefer when steering onto a track in NAV mode)
- NAV change limit (the limit of the automatic course change at the approaching waypoint)

Select *Seatrial* by pressing the **STBD** button and confirm by rotating the course knob clock-wise.

Compass calibration

This function will activate the compass calibration procedure for Simrad compasses connected to Robnet2 and the Autopilot Computer terminals (HS).

Notes !

1. *The RC36 Rate Compass that comes with the autopilot as standard will store the calibration and off-set data in its own memory.*
2. *Calibration is made on the compass that is active for the autopilot. The active compass is the one that is displayed on the compass calibration screen.*

   RATE-0 = Rate compass

Before you start the compass calibration, make sure you have enough open water around you to make a full turn with the boat.

The calibration should be done in calm sea conditions and with minimal wind to obtain good results. Use about 60-90 seconds to make a full circle.

Increase speed: >>>>>>

Decrease speed: <<<<<<

Appropriate speed: > <

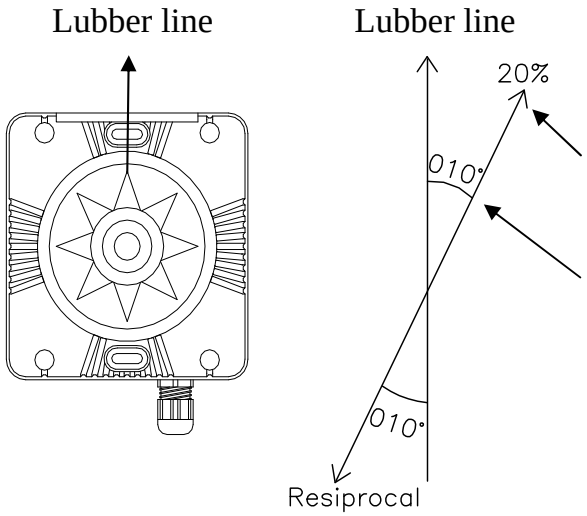
1. Select the ‘Calibration’ item on the display
2. Begin turning the boat (port or starboard).
3. Confirm start of calibration by turning the course knob clockwise. The display will flash “Calibrating”. Establish your turning rate using the arrows in the display.

4. When the calibration is completed, (after having made approximately 1 1/4 turns), it will be confirmed by the display reading “Confirmed”.

Compass deviation

The heading from a magnetic heading sensor will normally have a deviation when compared with the actual direction of the earth’s magnetic field. This is caused by interference from the boat’s local magnetic field. The deviation will be at a minimum if the compass is placed as far as possible from any magnetic object on board. On the other hand, you may have to compromise with other requirements for the installation of the compass (page 61).

During the calibration, the compass will measure the magnitude and direction of the local magnetic field from where the compass is mounted. The magnitude is given in % of the magnitude of the earth’s magnetic field. If the local magnetic field is stronger than the earth’s magnetic field (the local field is reading more than 100%), the compass calibration will fail. If the local field is reading more than 30%, you should look for any interfering magnetic objects and remove them, or you should move the compass to a different location. The local field angle will aid you to the local interfering magnetic object. See drawing.


Lubber line
Lubber line
20%
010°
010°
Resiprocal
Magnitude of local field in % of earth’s magnetic field.
Direction of local field with respect to lubber line. It can also be on the reciprocal.

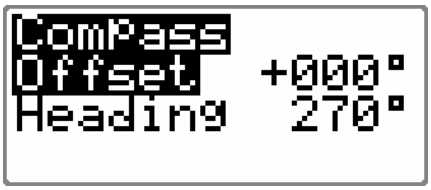
Note ! *In certain areas and at high latitudes the local magnetic interference becomes more significant and heading errors exceeding ±3° may have to be accepted.*

Compass Offset

After calibration, also check the compass readout against a known reference, a compensated compass or a bearing. If the reading has a fixed offset, proceed to next menu item by pressing **STBD** button or return to STANDBY mode by pressing the **STBY** button.

Note ! *Offset correction is always performed after the calibration. If you use COG as a reference for the offset remember it has to be a magnetic reading.*

The compass OFFSET feature allows you to correct for a fixed heading offset. This offset may be present as a result of the compass being installed with a lubber line offset or if a fixed offset remains after the calibration procedure has been completed. The value of compass offset is specific to the heading sensor that is selected at the time the offset is entered. This means that you can have individual offsets for each compass installed.



Select the amount of correction by turning the course knob to offset the heading to agree with the known, accurate heading. The *Offset* value can be either positive or negative.

Note ! *If an OFFSET still exists after having compensated for it, one of the following problems may still exist:*

- The heading reference to which you are comparing the compass is not correct.
- The automatic calibration is not correct. Refer to above “Compass deviation”.

Proceed to the next menu item by pressing the **STBD** button, or return to Standby mode by pressing the **STBY** button.

Set Thrust Direction

(Only applicable if a thruster is connected)

Rotate the course knob clockwise to activate the *Set thrust direction* setting.

Rotate the course knob CW and verify that the vessel turns to starboard. The thruster stops after 10 seconds, or when the **STBD** button is pressed.

If the boat turns to port when the course knob is turned CW, rotate the knob to port to ensure a starboard turn.

The autopilot has now been set to the correct thrust direction.

On thrusters, a change in direction command will always be delayed 1 second to prevent thruster breakage.

Proceed to the "**Parameters**" item by pressing the **STBD** button or return to STANDBY mode by pressing the **STBY** button.

Wind Offset

Note !

This offset only applies if you have a wind transducer directly connected to SimNet (IS12TW) or a wind transducer that outputs data on NMEA2000 format.

The Wind Offset feature allows you to correct for a fixed wind angle offset. Steer the boat directly into the wind with a damping of 15s. Keep the bow a steady heading for 15-20 sec. and read the wind angle. If necessary turn the course knob to input an off set that makes the display read Wind 000°.

The *Offset* value can be either positive or negative.

Wind damping

Damping of the apparent wind angle is made by the Advanced Wind Filter (AWF) in the Autopilot Computer.

The inputs to the AWF are heading, boat speed, apparent wind angle and wind speed. Verify that these inputs are available in User Setup/Source Select.

The boat speed input to the AWF is Speed Over Ground (SOG) or speed through water. If none of these are available, the AWF will use a boat speed that is 1.5 times the the Transition Speed set in the Installation/Seatrial menu.

Range: 1 – 100 seconds

Default: 15 seconds

Recommended setting for power boats: 1-5 seconds.

Depth Offset

Note ! *This adjustment only applies to "smart" depth transducers that outputs depth on NMEA2000 format. NMEA0183 sentence 'DPT' contains offset and the depth reading is from the surface. NMEA0183 sentence 'DBT' contains no depth offset and the reading will be from the position of the transducer.*

When the depth offset is set to zero, the indicated depth is from the transducer to the bottom.

To read the depth from the water surface to the bottom you have to set the depth offset according to the vertical distance between the surface and the transducer, i.e. positive (+) value. If you want to indicate the depth from the keel to the bottom you have to set the depth offset according to the vertical distance between the transducer and the keel, i.e. negative (–) value.

Automatic tuning

Automatic tuning is a feature that automatically sets the two main steering parameters (Rudder and Counter Rudder) by taking the boat through a number of S-turns.

Automatic tuning is an optional procedure that is not required for the autopilot to function. The autopilot is preset with steering parameters that should steer most boats in the 30 - 80 foot range. It is, however, recommended to perform an automatic tuning as part of the sea trial.

Recommended speed during *Automatic tuning* varies with the type of boat, but should not exceed 10 knots (6-8 knots is recommended). It should be performed in calm or moderate sea conditions.

Note ! *Automatic tuning should not be performed at planing speed or in following seas!*

The parameter values calculated during *Automatic tuning* becomes the HI parameters. The LO parameters are automatically set to 66% of the HI.

It also is recommended to perform the *Automatic tuning* steering East or West, as this will yield the best balanced parameters.

Note ! *After the Automatic tuning has been completed the rudder must be controlled manually, as the autopilot has returned to STBY mode.*

WARNING ! The Automatic tuning function will take control of the boat and perform a number of S-turns. It must always be performed in open waters at a safe distance from other traffic. The Automatic tuning function may take from 1 to 2 minutes to complete. To stop the Automatic tuning, press the STBY button.

Activate the Automatic tuning, by rotating the course knob clockwise. The display will flash “Automatic tuning”.

After an *Automatic tuning*, there should be no need for further adjustments. “Fine tuning” of these parameters are made by the response control (see page 46). However, viewing or changing the parameters can be made from within the Parameters menu item. See also “Recall Autotune” on page 86.

Proceed to the next menu item by pressing the **STBD** button, or return to Standby mode by pressing the **STBY** button.

Transition Speed

The transition speed is the speed where the autopilot will automatically change the steering parameter set from HI to LO parameters, or vice versa (page 22).

The default setting of transition speed is 5 kts.

It is recommended that you set the transition speed to a speed that represents the speed where the hull begins to plane, or the speed where you change from slow to cruising speed.

The speed used for the automatic transition is obtained with the following priority:

1. Speed through water from the speed log source.
2. Speed Over Ground (SOG) from the GPS/Chartplotter.

If no speed data is available, manual speed selection is required. See also chapters 2.8 and 2.9.

Rotate the course dial clockwise until the transition speed is set to the desired value in knots.

Range: OFF – 30 knots

Default: 5 knots

Proceed to next menu item by pressing **STBD** button.

Init NAV

Sets a firm or soft approach to the track line when entering the NAV mode at the first leg. The approach angle is dependant (adaptive) on the distance (XTE) from the track line and the boat speed.

Select firm or soft approach to the track line by rotating the course knob.

Range: Soft - Firm

Default: Soft

Proceed to the "**Parameters**" item by pressing the **STBD** button or return to STANDBY mode by pressing the **STBY** button.

NAV change limit

In NAV mode, when the required course change at the approaching waypoint is bigger than the set limit, you are prompt to verify that the upcoming course change is acceptable. The limit can be set to 10°, 20° or 30°.

Default: 10°

4.7 Parameters

To access the Parameters, rotate the course knob clockwise.

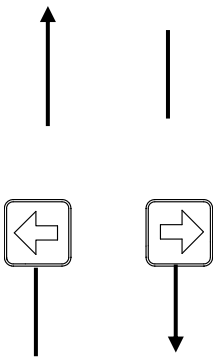
A boats steering parameters found by the Automatic tuning can be looked at and if needed changed under this menu item. The steering parameters can also be set manually instead of performing an Automatic tuning. The parameters are divided into two sets:

- HI value parameters for automatic steering at low speed
- LO value parameters for automatic steering at high speed

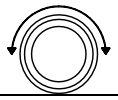
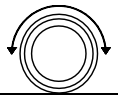
Step through the menu items by pressing the **STBD** or **PORT** buttons. Adjust the value by rotating the course knob.

Manual parameter adjust

Use course knob to adjust parameters



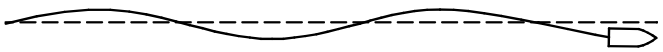
Use PORT and STBD buttons to step through parameters

Displayed parameter	Default	Automatic tuning	Manual
LOw			
Rudder LO	0.20		
Cont.Rudder LO	1.00		
Autotrim LO	40 sec.		
HIgh			
Rudder HI	0.30		
Cont.Rudder HI	1.40		
Autotrim HI	40 sec.		

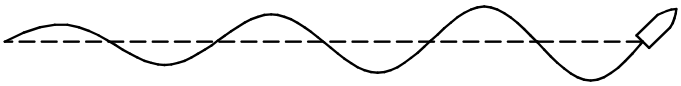
Note ! *The values in the table are factory set (default) and listed for information only. After having performed the Automatic tuning, the values may differ from those listed in the table. See also "Automatic Tuning" previously in this chapter.*

The two most important parameters that determine the performance of the automatic steering are Rudder and Counter Rudder.

Rudder sets the rudder gain which is the ratio between the commanded angle and the heading error.



Too little Rudder

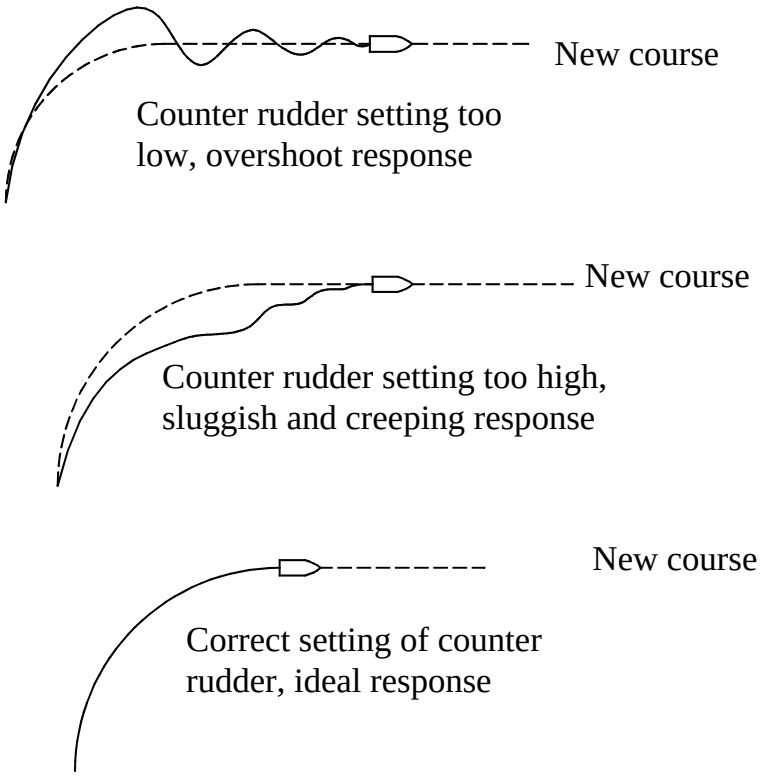


Too much Rudder

- Too little Rudder and the autopilot fails to keep a steady course.
- Too much Rudder gives unstable steering and reduces speed.
- Low speed requires more Rudder than high speed.

Counter Rudder is the parameter that counteracts the effect of the boats turn rate and inertia. For a short time period it is superimposed on the proportional rudder response as provided by the heading error. It may sometimes appear as if it tends to make the rudder move to the wrong side (counter rudder).

The best way of checking the value of the Counter Rudder setting is when making turns. The figures illustrate the effects off various Counter Rudder settings.


New course
Counter rudder setting too low, overshoot response
New course
Counter rudder setting too high, sluggish and creeping response
New course
Correct setting of counter rudder, ideal response

Autotrim standard value is 40 sec. which should work well on most boats.

Recall Autotuned?

To recall the parameter values that were achieved during the *Automatic tuning* procedure, rotate the course knob clockwise. When parameter values are recalled, *Confirmed* is displayed.

Exit the Parameter menu by pressing **STBD** button to proceed to the Service menu, or press **STBY** to return to normal autopilot operation.

4.8 Service Menu

Select STANDBY mode and then enter the Installation Menu by pressing and holding the **NAV/WIND/SETUP** button for 5 seconds. Select “Service” by pressing the **STBD** button and confirm by rotating the course knob clockwise.

System data and *SimNet data* are test functions to analyze data processed by the autopilot.

To exit the menu, press any mode key (STBY, AUTO or NAV).

System Data Menu

Select *System data* by rotating the course knob clockwise.

Step through the menu by pressing the **STBD** button. The menu provides you with additional system data that can be useful when testing or trouble shooting the system.

Steer compass

Steering Compass readout, M=Magnetic, T=True

Rudder

Rudder angle. Between zero and 26 degrees.

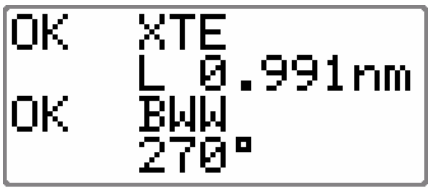
Input voltage

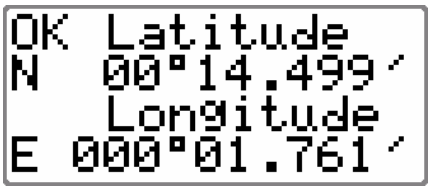
Mains voltage on input terminals.

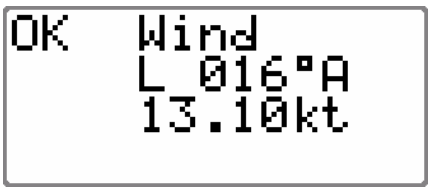
SimNet Data Screen

Select the screen by pressing the **STBD** button and confirm by rotating the course knob clockwise.

Step through the menu by pressing the **STBD** button. The menu provides you with status information about the different SimNet messages used by the system.







Decoding

The incoming signals are decoded according to a built in priority table in the autopilot. Cross Track Error and bearing information are taken from the NMEA messages with highest priority.

For all data items, one of the following codes will be displayed:

– – – No data or no NMEA sentence containing the data needed is available at the input port.

OK Valid data found

INV Message with invalid information.

FRM Message has format failure such as

a) Incorrect check sum

b) Wrong contents in datafield(s)

If data are missing or invalid, perform the following:

- Check the NMEA signal monitor (see below)

- Open the source select page in the User Setup menu and check that data are available
- Check the navigator setup and make sure it is transmitting appropriate data.
- Perform a NMEA Port Test (hardware) as per below.

Note ! *The "WIND" reading is the apparent wind from the port (L) or starboard (R). The "SPEED" reading is the speed through water.*

SimNet setup

Under *Service* in the Installation Menu, select *Simnet setup* by pressing the **STBD** button and confirm this by rotating the course knob clockwise.

Sn 00000 is the unique SimNet ID number for the specific autopilot control unit.

Group selection

SIMRAD: Autopilot is part of the Simrad Group. Source selection will be common for the products in the group (synchronized).

STAND ALONE: Source selection for the autopilot will not be transferred to other products in the Simrad Group (no synchronization).

Backlight Illumination

Set backlight to synchronize with one of the illumination banks (1-3) available on the SimNet, or to STAND ALONE for individual control of the autopilot illumination.

Instance number

An item to identify units by a number when the autopilot is connected to a NMEA2000 Network. On SimNet units the Instance number is added to the product name e.g. AP26-1, AP26-2 for easy identification on various display screens.

SimNet gateway

Indicates which control unit that transmits and receives information on SimNet. The display verifies by reading 'Yes', all other units read 'No'.

Global SimNet reset

Resets the entire SimNet setup in the Simrad Group and initiates a new automatic interface setup. See chapter 4.1.

Master Reset

Note !

A Master Reset is part of the final test at the factory, which will reset the memories to factory settings. Unless you need to clear all stored values during the installation setup procedure, you should not perform a Master Reset.

Under *Service* in the Installation Menu, select *Master reset of memories* by pressing the **STBD** button and confirm this by rotating the course knob clockwise.

The Master Reset needs a double confirmation to prevent an accidental reset. To perform a Master Reset, rotate the course knob clockwise and observe the display; then rotate the course knob counter

clockwise. The display will then read: “Master Reset confirmed”.

Unless you have made a Master Reset, exit the Installation Menu by pressing **STBY** to return to normal autopilot operation.

In the event a Master Reset has been made, refer to chapter 4.2.

Final sea trial

After having completed all settings in the Installation Menu, take the boat out and perform a final sea trial in open waters at a safe distance from other traffic.

- Steer the boat on all cardinal headings in AUTO mode.
- Start with low and medium speeds to get familiar with the response from the autopilot.
- Try the effect of LO and HI parameter settings.
- If the hardware for automatic HI/LO selection is connected and configured, verify that the HI/LO transition is occurring, and the HI/LO parameters are changing after the transition speed is crossed (by more than 1 Knot higher or lower speed).
- Try the Dodge and U-turn function.
- If a Non-Follow Up lever (or handheld remote) is connected, test change of modes and verify port and starboard steering commands of the lever.
- Set waypoints into each navigator connected to the system, and verify that the autopilot steers in NAV mode for each NAV source.
- Try the NoDrift mode.
- Provide the owner with user training.

Providing user training

The user should be instructed in the "basic" operational functions, such as:

- Turning the system on and off

- Changing modes. Explain briefly what takes place in the different modes.
- Regaining manual control from any mode. Point out in what modes the helm is engaged by the autopilot and vice versa, see page 18.
- Taking command at an "inactive" station, if applicable.
- Using the lock mode, how to lock/unlock and how to shut the system down from a locked control unit, if applicable.
- Use of the Non-Follow-up and Follow-up steering modes and learning the difference between the two.
- Use of a remote Non-Follow-up and Follow-up controller, if connected.
- Changing course by rotary knob and buttons.
- Stepping through the User Set-up Menu learning how to (and why to) change the settings.
- How to select alternative sources for heading (compass), navigation (GPS), chartplotter), speed, depth etc. if available.
- Understand the difference between NAV mode and NoDrift mode.
- Locating compasses and knowing to keep magnetic items away.
- Locating the Mains circuit breaker and the separate SimNet circuit breaker if provided.
- Knowing the use of thrusters with the autopilot.

5 MAINTENANCE

5.1 Control unit

The AP26 and AP27 Control Units will under normal use require little maintenance.

If the unit requires any form of cleaning, use fresh water and a mild soap solution (not a detergent). It is important to avoid using chemical cleaners and hydrocarbons such as diesel, petrol etc.

Make sure that all open Robnet2 connectors are fitted with a protection cap.

It is advisable at the start of each season to check all connections to the control unit head. If the Control unit is not removed from the boat, it should be covered with the white protection cover.

5.2 Autopilot Computer

No special maintenance is required. It is advisable, however, at the start of each season to make a visual inspection of the internal and check all connections.

5.3 Compass

If the compass is exposed to the weather, make a visual inspection at 2-3 months intervals, and at the start of each season.

5.4 Exchange of software programme

You will need a special kit for a PC to perform the programming of the AC05 Autopilot Computer and the AP26/AP27 Control Unit. Order the following from Simrad:

Programming kit P/N 22088595.

Instructions are included.

Autopilot Computer

Remove the bottom cover to get access to the software download connector.

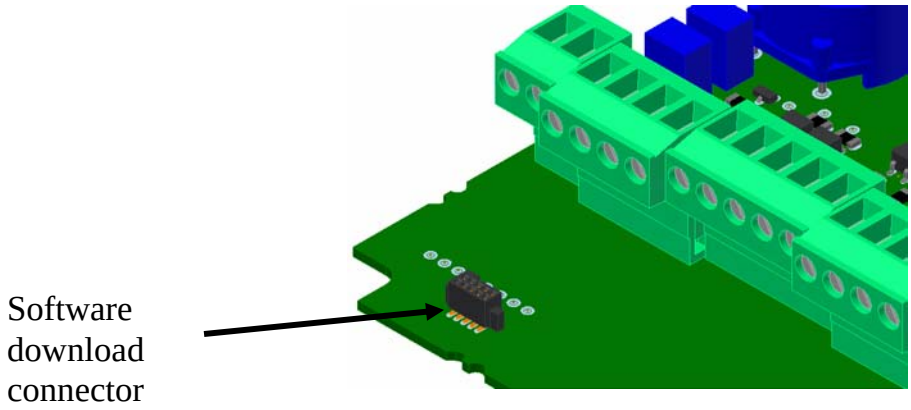


Figure 5-1 Part of AC05 PCB

Autopilot Control Unit

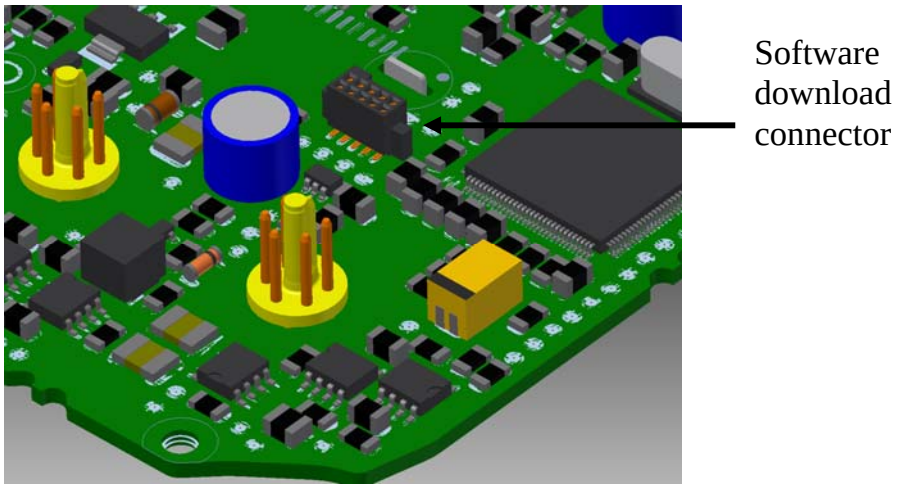


Figure 5-2 Part of AP26 PCB

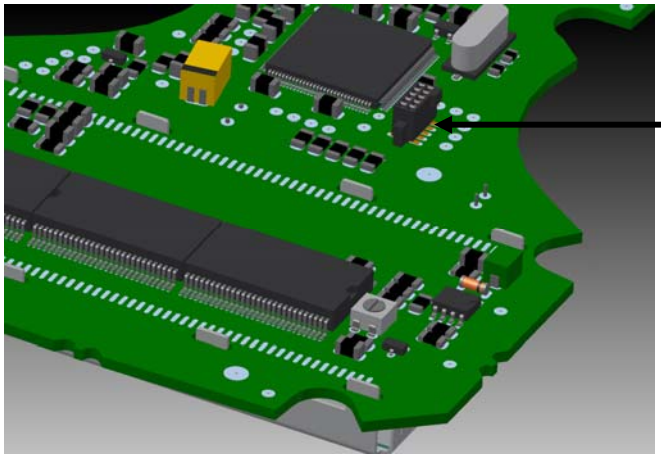


Figure 5-3 Part of AP27 PCB

Remove the cables and unscrew the screws that secure the back cover. Apply a firm pull with your fingers to pull the back cover loose from the connector pins. Then you have access to the software download connector.

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6 TROUBLE SHOOTING

An autopilot is a complex system. Its performance dependents on a proper installation and a successful sea trial.

In the event of an autopilot failure, the autopilot's numerous test features will assist you in isolating a probable fault.

Audible and visual alarm is provided for every fault being detected.

The audible alarm is reset by pressing any button (e.g. by changing mode from AUTO to STANDBY). All visual alarms will remain and alternate with the operating display until the fault has been rectified. Refer to the table below for hints and try to solve the problem yourself. You may also consult your nearest Simrad dealer for assistance, if required.

Perform any repair action in the listed sequence.

Note ! *– – – in a display indicates that data is missing.*

6.1 Alarms

Display readout	**Probable fault**	**Recommended action**
System failure Alarms:		
The boat is off course	Boats heading is outside fixed off course limit of 20 deg. (Automatic reset when inside limit.) Extreme weather conditions, too slow speed.	1. Check steering parameters (Rudder, Autotrim, Seastate-filter). 2. Increase Rudder value 3. Increase boat speed, if possible, or steer by hand.
NAV. data failure	Missing or invalid NAV data.	1. Check the Nav. Receiver/GPS setup. 2. See *Service menu* Chapter 4.8.

Display readout	Probable fault	Recommended action
Shallow water (Only if AP25 is part of the system)	The depth is inside the set limit or outside the range. Depth data is missing.	1. Carefully observe the actual depth. 2. Adjust the alarm limit if not hazardous. 3. Steer to safe depth, the alarm will reset automatically. 4. Turn off the shallow alarm if depth data is missing.
Compass data missing	No data from selected compass.	1. If more that one compass is connected to the system, refer to the *User Setup/Source select* menu to select a different compass. 2. Make a source update if no compass is available. 3. Check connections. 4. Replace compass PCB *(Note: Do not cut cables. There are screw terminals inside).*
No connection with IPS system	Data missing or erratic	Check connections to Volvo Autopilot Interface. Also refer to the Volvo IPS User Manual.
Failure active Control Unit	Active control unit goes silent.	1. Press the **STBY** button on an "Inactive" unit to reset. 2. Check/repair Robnet2 cable. 3. Replace the control unit PCB.

Display readout	Probable fault	Recommended action
ACXX high temp.	Excessive temperature inside Autopilot Computer	Switch off autopilot
Memory failure ACXX	Wrong checksum on memory parameters or variables. Autopilot Computer will use default values.	Perform a "Master reset". Switch off and on again. If the alarm is repeated, replace Autopilot Computer PCB.
Com. failure with ACXX	Faulty Autopilot Computer or poor Robnet2 cable connections from the same.	1. Check Robnet2 connectors and cable. 2. Replace Autopilot Computer PCB.
Low supply voltage	Supply voltage less than 10,8 Volts	1. Verify in the System Data Menu 2. Switch autopilot off, charge batteries 3. Check/repair battery charger
High supply voltage	Supply voltage exceeds 31,2 V	1. Verify in the System Data Menu 2. Switch the autopilot off 3. Check / repair battery charger
No thruster response	The thruster interface unit is not responding	See TI25 Thruster Interface manual Trouble shooting.

7 SPARE PARTS LIST

AP26 Control Unit

22087910	AP26 Control Unit
22088439	AP26 mounting kit consisting of:
	22084529 Cabinet corners
	22085807 Gasket
	44165181 Screw 3.5x19
	44165645 Screw 3.5x32
22085872	Optional mounting bracket consisting of:
	44148906 Screw M4x12
	22084776 Right bracket
	22084784 Left bracket
	22084859 Locking knob
	22085880 Cradle
	44163145 Locking washer for left and right bracket
	44163160 Locking washer for cradle
22087925	AP26 Front Ass’y
22087944	AP26 Back Ass’y
22087761	AP26 Board Ass'y
22084750	Protection Cover
22088181	AP26&AP27 software

AP27 Control Unit

22088090	AP27 Control Unit
22086276	AP27 Standard Mounting kit
22087795	AP27 Board Ass'y
22088181	AP26&AP27 software
22086193	Back cover

AC05 Autopilot Computer

22089007	AC05 Autopilot Computer
44134948	AC05 Installation Accessories
22089023	AC05 PCB Ass'y
22089262	AC05 SimNet & Robnet2 terminal
44134922	AC05 Connector Cover
22089254	AC05 Gasket for Connector Cover

22089247	AC05 Bushing
44152056	Screw M3x8
44152155	Screw M3x16
44142552	Screw M5x20
44120681	Plug-in Terminal 4-way
44133601	Plug-in Terminal 5-way
44135333	Plug-in Terminal 2-way
22089304	AC05 Software

RC36 Rate compass

22086920	RC36 Rate Compass
22081442	Installation Accessories Consisting of:
	20104972 Mounting plate (2)
	44140762 Screw 3.5x25 (2)
	44140770 Screw 30x9 (4)
	22081376 Plug (2)
22086938	RC36 PCB Ass'y
24005647	Robnet2 Cable, 15 m with Plug

Robnet2 cables

24005613	Robnet2 cable, 1 m (3’) with two plugs
24005621	Robnet2 cable, 5 m (16’) with two plugs
24005639	Robnet2 cable, 10 m (33’) with two plugs
24005647	Robnet2 cable 15 m (49’) with one plug
24005662	Robnet2 Joiner

SimNet cables and accessories

24005829	SimNet cable 0.3 m (1’)
24005837	SimNet cable2 m (6.6’)
24005845	SimNet cable 5 m (16.6’)
24005852	SimNet cable 10 m (33’)
24005860	SimNet T-Joiner
24005878	SimNet cable gland
24005886	SimNet protection plug
24005894	SimNet termination plug

24005902	SimNet power w/termination 2 m (6.6’)
24005910	SimNet power w/o termination 2 m (6.6’)
24005936	AT10 Universal NMEA0183 converter
24005944	AT15 Active Tee w/connector, IS15
24005928	SimNet cable protection cap
24005729	SimNet cable to Micro-C. Adapter (drop) cable for SimNet products in a NMEA2000 network.
24006199	Interconnection cable to Volvo IPS 1.0 m (3’)

8 TECHNICAL SPECIFICATIONS

8.1 AP26 and AP27 Autopilot System

Boat size and type:..... Up to 80 feet, Power, Displacement, Sail

Steering system types: ..... Volvo Penta IPS

Inter-unit connection: ..... Robnet2 network or two-wire supply/data

System ON/OFF: ..... From control units

Supply voltage: ..... 12 or 24 VDC

Power consumption: ..... Dependent on system configuration

Environmental Protection:

- Control Unit: ..... IP56 from front, IP43 from back.
- RC36, RFC35, CDI35: IP56
- RF300: IP56
- AC05: IP22

EMC protection: ..... EN60945 : 1993, A1 : 1993

Automatic Steering control:

- Rudder Drive: ..... Volvo Penta IPS
- Parameter selection: ..... Automatic with manual override
- Sea state control: ..... Adaptive sea state filter or manual

Language selection: ..... English, Norwegian, French, Spanish, German, Italian, Dutch, Swedish.

Electronic Interface:

- Navigation interface:..... Standard (NMEA 0183)
- Compass heading output: . Simrad and Furuno radar display (clock/data)
- NMEA2000 interface..... Via SimNet port and SimNet/NMEA2000 adapter cable

Heading sensors:

Standard: ..... RC36 Rate Compass

Course Selection: ..... Rotary course dial and push button

Alarms: ..... Audible and visual, optional external

Alarm modes: ..... Off course, system failures, overload

Steering modes: ..... Standby, Non-follow up, Follow-up, Auto, Nav

Special Turn modes: ..... Dodging, U-Turn, C-Turn, Spiral, Zigzag, Square, Lazy S, Depth contour

Instrument screen interface:

Instrument screen	**NMEA0183 messages and SimNet**
MAIN (HDG+RUDDER)	ROBNET2 PROPRIETARY, NMEA HDT and HTG, SimNet
SPEED/DEPTH	VHW + DBT/DPT, SimNet
APPARENT WIND	MWV, SimNet
TRUE WIND/WIND DIRECT.	MWV + VTG/RMC, SimNet
POSITION	GGA/RMC/RMA, SimNet
NAV/TRACK DATA	APB + VTG/RMC + GGA/RMC + RMB/BWC, SimNet
LOG/SEA TEMPERATURE	VLW + MTW, SimNet

Note ! *Alternative messages are separated by slashes.*

8.2 AP26 Control Unit

Dimensions: ..... See Figure 8-1

Weight: ..... 0,5 kg (1.1 lbs)

Power consumption ..... 3 W

Display:

Type: ..... Backlit LCD matrix display
Resolution: ..... 80 x 32 pixels

Color: ..... Black

Illumination: ..... Adjustable in 10 steps

Environmental Protection: ..... IP56 from front, IP43 from back.

Safe distance to compass: ..... 0.3 m (1.0 ft.)

Temperature:

Operating: ..... 0 to +55 °C (+32 to +130 °F)
Storage: ..... –30 to +80 °C (–22 to +176 °F)

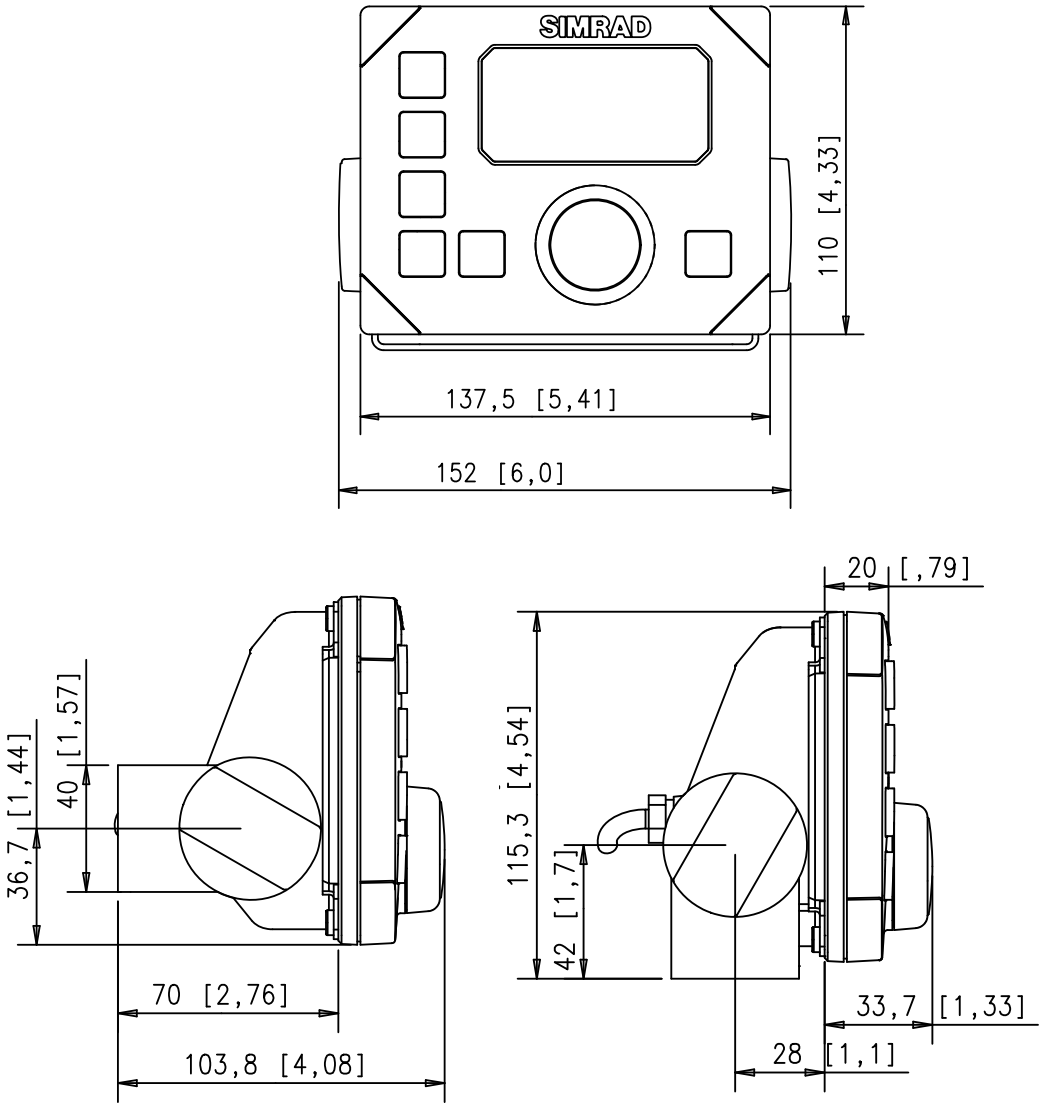


Figure 8-1 AP26 Control Unit – dimensions
(Mounting bracket is optional equipment)

8.3 AP27 Control Unit

Dimensions: ..... See Figure 8-2
Weight: ..... 0,57 kg (1,25 lbs)
Power consumption ..... 3 W
Display:
Type: ..... Backlit LCD matrix display
Resolution: ..... 80 x 32 pixels
Color: ..... Black
Illumination: ..... Adjustable in 10 steps
Environmental Protection: ..... IP56.
Safe distance to compass: ..... 0.3 m (1')
Temperature:
Operating: ..... 0 to +55 °C (+32 to +130 °F)
Storage: ..... –30 to +80 °C (–22 to +176 °F)
Mounting: ..... Handheld or mounted in a fixed, bracket mount.
Cable ..... 7m (23') special Robnet2 cable with air tube.

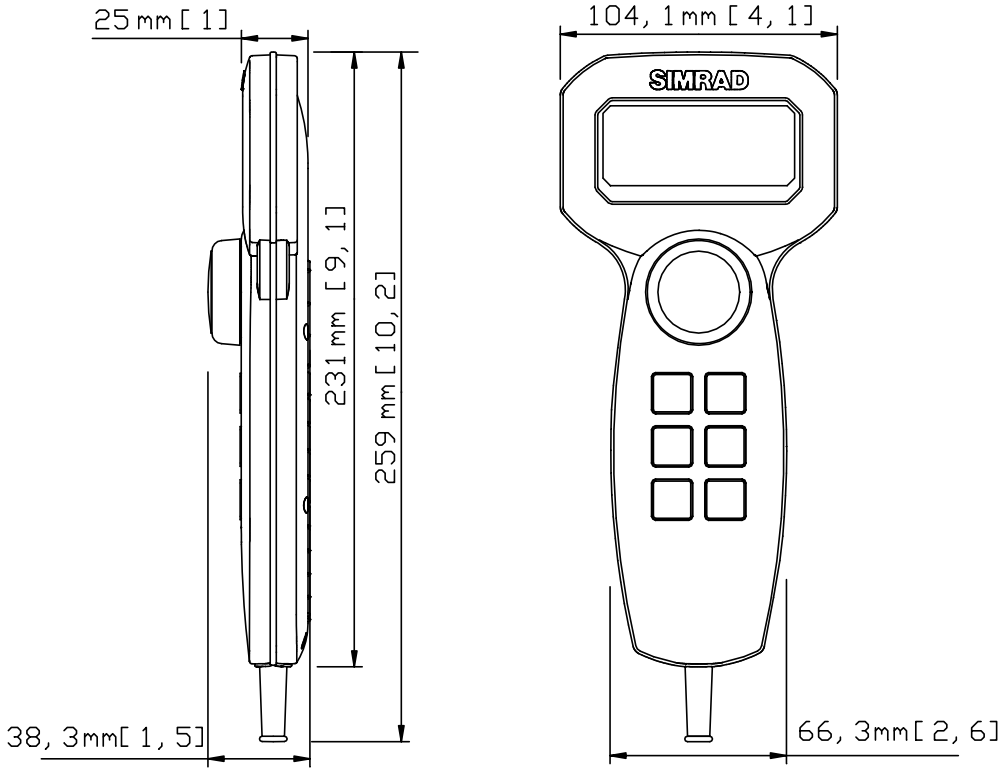


Figure 8-2 AP27 Control Unit - dimensions

8.4 AC05 Autopilot Computer

Dimensions: ..... See Figure 8-3

Weight: ..... 1,1 kg (2,4 lbs)

Supply voltage: ..... 10.8 - 31.2 VDC

Reverse voltage protection ..... Yes

Environmental Protection: IP22

Safe distance to compass: ..... 1.0 m (3 ft.)

Power consumption: ..... 5 Watt (electronics)

External Alarm: ..... Open collector

Temperature range:

Operation: ..... 0 to +55 °C (+32 to +130 °F)

Storage: ..... –30 to +70 °C (–22 to +158 °F)

Mounting: ..... Bulkhead mount, cable inlet downwards

Material: ..... Epoxy coated silumin and ABS

Number of control units: 7

Input for NFU control: ..... Yes

Radar clock/data interface ..... Yes

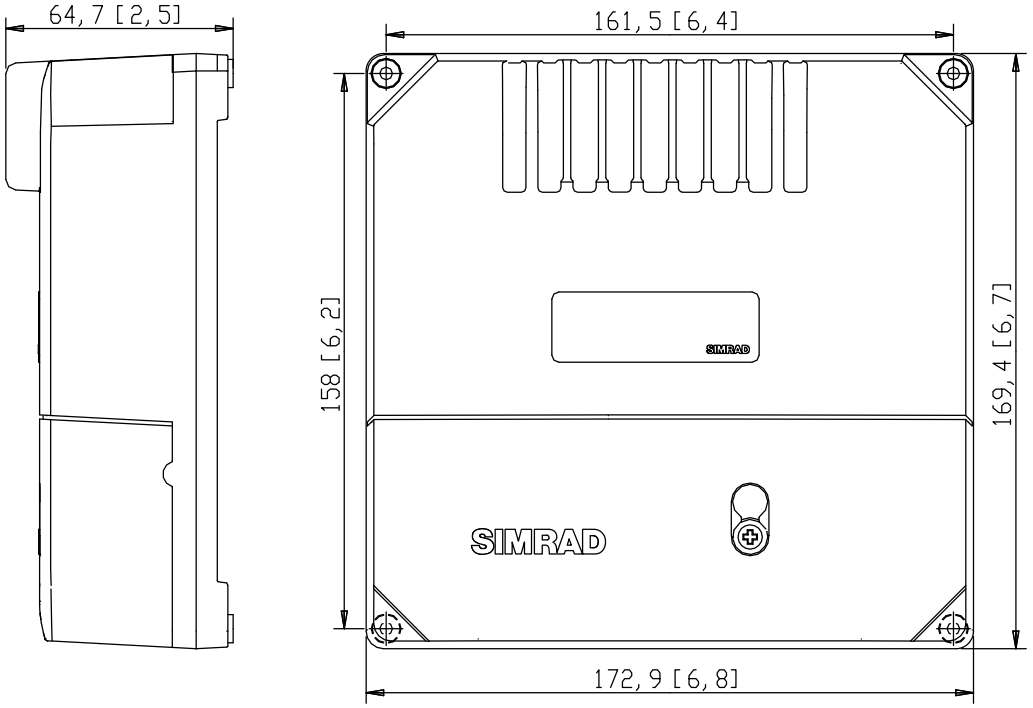


Figure 8-3 AC05 Autopilot computer - Dimensions

8.5 RC36 Rate compass

Dimensions: ..... See Figure 8-4
Weight: ..... 0,9 kg (2,0 lbs)
Supply and interface: Robnet2
Power consumption: ..... 0,9 watts
Automatic Performance:
- Calibration: ..... Automatically activated by control head
- Gain compensation: ..... Automatically adjusted continuously
- Rate sensor stabilized heading output

Accuracy: ..... <1.25° (rms)
Repeatability: ..... <0.2° (rms)
Roll/Pitch: ..... ± 35 degrees
Cable supplied: ..... 15 m TP shielded Robnet2 cable
Temperature range:
- Operation: ..... 0 to +55 °C (+32 to + 130 °F)
- Storage: ..... –30 to +80 °C (–22 to +176 °F)

Environmental Protection: IP56
Mounting: ..... Deck or bulkhead
Material: ..... White ABS

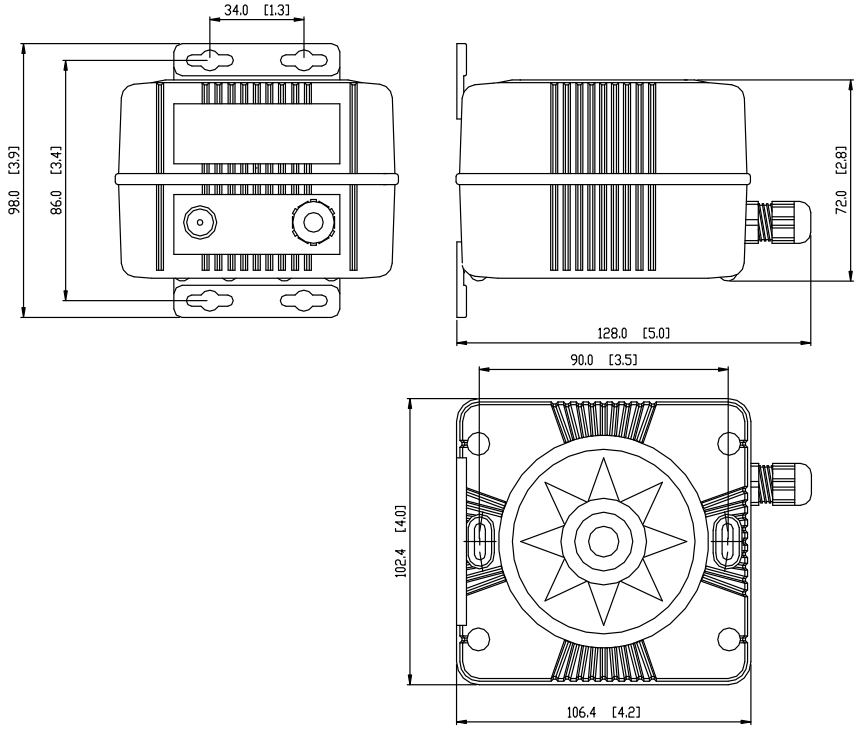
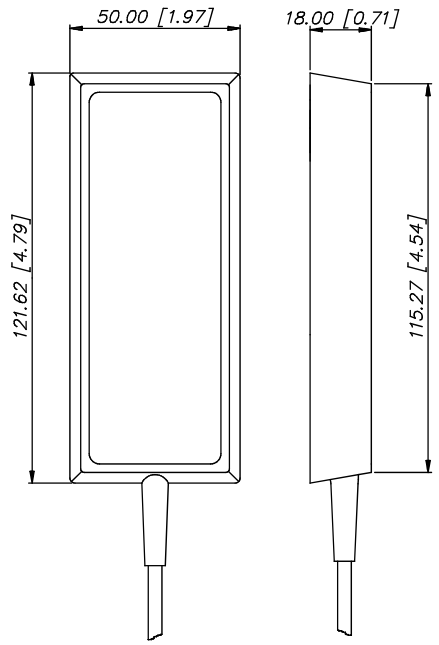


Figure 8-4 RC36 Rate Compass - Dimensions

8.6 R3000X Remote Control



Dimensions: ..... See Figure 8-5

Weight:..... 0,4 kg (0,9 lbs)

Material:.....Epoxy coated aluminum

Protection IP56

Safe distance to compass: .....0.15 m (0.5 ft.)

Temperature range:

Operation: ....–25 to +55 °C (–13 to +130 °F)

Storage: .....–30 to +80 °C (–22 to + 176 °F)

Cable length: ..... 7 m, shielded

Mounting bracket:.....Supplied

Figure 8-5 R3000X - Dimensions

8.7 JS10 Joystick

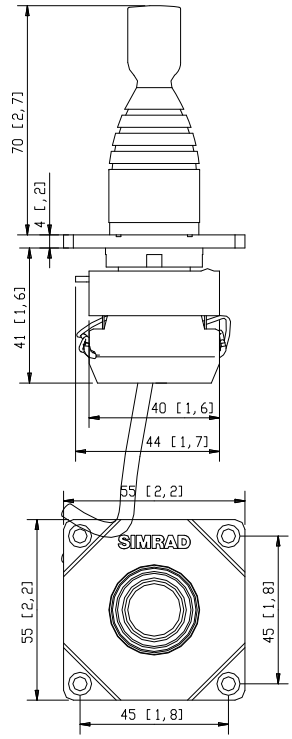


Figure 8-6 JS10 Joystick Dimensions

Dimensions: .....See Figure 8-6

Weight: .....0.5 kg (1.1 lbs.)

Environmental Protection:

Joystick..... IP66

Terminals..... IP20

Safe distance to compass:..... 0.15 m (0.5 ft.)

Shock resistance (according to MIL 202 B method 202 A):

1/2 sinusoid 11 ms:

No damage or disassembling at 100 g

Vibration resistance (according to IEC 68-2-6):

16 g with frequency range from 40 to 500 Hz and maximum shifting 0,75 mm (peak -to- peak)

Temperature range:

Operation: .....–25 to +70°C (–13 to +158°F)

Storage:.....–40 to +70°C (–40 to +158°F)

Mounting: ..... Panel-mount

Cable: .....10 meters (33 ft.)

8.8 SimNet

Maximum number of products connected in a network:.....50
Maximum cable length:..... .....120 m (400’)
Bit rate of the bus: ....250 Kbit/second
Maximum DC current through a single SimNet plug 5A
SimNet power supply: 12VDC
Maximum drop cable length:..... .....6 m (20’)
Maximum total length of all drop cables (accumulated):.....60 m (200’)
Environmental protection: Cable and plug/connector system..... IP66
Temperature:..... ..... 70°C (158°F)

8.9 IP protection

Each part of a Simrad autopilot system has a two digits IP protection code.

The IP rating is a method to classify the degree of protection against solid objects, water ingress and impact afforded by electrical equipment and enclosures. The system is recognized in most European countries and is set out in a number of British and European standards.

The first code number describes the protection against solid objects, and the second number describes the protection against liquids.

FIRST NUMBER Protection against solid objects		**SECOND NUMBER** Protection against liquids	
IP	**TESTS**	**IP**	**TESTS**
0	No protection	0	No protection
1	Protection against solid objects up to 50 mm, eg. accidental touch by hands.	1	Protected against vertically falling drops of water (eg. condensation).
2	Protection against solid objects up to 12 mm, eg. fingers.	2	Protected against direct sprays of water up to 15° from the vertical.
3	Protection against solid objects over 2.5 mm (tools + wires)	3	Protected against sprays to 60° from the vertical.
4	Protection against solid objects over 1 mm (tools + wires + small wires)	4	Protected against water sprayed from any direction.
5	Protection against dust - limited ingress (no harmful deposit)	5	Protected against low pressure jets of water from all directions - limited ingress permitted.
6	Totally protected against dust	6	Protected against strong jets of water, eg. for use on shipdecks - limited ingress permitted.
		7	Protected against the effects of immersion between 15 cm and 1 m.
		8	Protected against long periods of immersion under pressure.

8.10 SimNet messages

SimNet/NMEA2000 messages and data overview

Message ident.		127250	127245	130306	128267	130310	128259	128275	65408*	129025	129029	129026	130577	128259	127250
Data source: **N**=nav, **P**=pos, **H**=heading, **D**=depth, **Wa**=Wind apparent, **Wt**=Wind True, **WaS**=Water Speed/ **WaT**=Water temp, **DI**=Distance log, **C**=Calculated):		H	C	Wa / Wt	D	WaT	WaS	DI	DI	P	P	P	P	P	P
Compass Data	Compass heading	1													
Rudder Data	Rudder angle														
Wind Data	Apparent wind angle			1											
	Apparent wind speed			1											
	True wind angle			1											
	True wind speed			1											
Depth Data	Depth ref transducer				1										
	Transducer-Keel Offset				1										
Speed Data	Speed through water						1								
Distance Log Data	Log distance and trip							1	1						
Temperature Data	Water temperature					1									
Position Data	Present position Lat, Lon									2	1				
	COG											2	1		
	Magnetic variation														1
	SOG											3	2	1	
Navigation Data	To-wp position														
	To-wp ident.														
	Bearing wp-wp														
	Bearing pos-wp														
	Distance pos-wp														
	XTE														
	Waypoint closure velocity														
Steering Data	Heading steering cmd, T / M														
APXX Gateway		x*	x	x*	x*	x*	x*	x*		x*		x*			

Additional PGNs supported

Simrad Propriatory

61184 Parameter Command
65408 Parameter Reply
130840 DataUserGroup Configuration
65323 DataUserGroup Request

NMEA2000

59392 ISO acknowledge
60928 ISO Adress claim

Indata use										Remarks:
129283	129284	65357*	65408*	127237				Out Gateway		* SimNet proprietary
N	N		N	C	AP16	AP25	AP26			
					d	d	d	x		
					d	d	d	x		
					d	d	d	x		
					d	d	d	x		
					d	d	d	x		
					d	d	d	x		
					d	d	d	x	In INFO views Depth+Offset is displayed if	
								x	offset is present	
					d	d	d	x		
						d		x		
					d	d	d	x		
					d	d	d	x		
					d	d	d	x		
								x		
					d	d	d	x		
	1							x		
			1		d	d	d	x		
	1				d	d	d	x		
	1				d	d	d	x		
	1				d	d	d	x		
1					d	d	d	x		
	1				d	d	d	x		
								x		
x*	x*	x*		x						*Only transmitted if NMEA183/RC36/RFC35 is source

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9 GLOSSARY

Apparent wind – The speed and direction from which the wind appears to blow with reference to the bow when the boat is moving (also called relative wind).

Arrival alarm – An alarm signal issued by a GPS/chartplotter that indicates arrival at or at a predetermined distance from a waypoint. (see arrival circle).

Arrival circle – An artificial boundary placed around the destination waypoint of the present navigation leg, the entering of which will signal an arrival alarm.

Bearing – The horizontal direction of one terrestrial point from another, expressed as the angular distance from a reference direction, usually measured from 000° at the reference direction clockwise through 359°.

BPW – Bearing to a specified waypoint from present position.

BWW – Bearing waypoint to waypoint - Bearing angle of the line between the “TO” and the “FROM” waypoint, calculated at the “FROM” waypoint for any two arbitrary waypoints.

COG - Course Over Ground - The actual direction of progress of a vessel, between two points, with respect to the surface of the earth, The vessel’s heading may differ from the course over ground due to the effects of wind, tide, currents.

GPS - Global Positioning System - This system is based on satellites in fixed orbits, circling the earth at an altitude of approximately 20,200 km. The system will provide the user with 24 hour a day all weather position coverage, with an accuracy of 5 to 30 meters.

Magnetic bearing – Bearing relative to magnetic north; compass bearing corrected for deviation.

Magnetic deviation – A local magnetic field onboard a vessel. Can interfere with the earth’s magnetic field and create compass readings that may deviate from the actual magnetic heading. The deviation will vary with the actual heading.

Magnetic heading – heading relative to magnetic north.

Magnetic variation - A magnetic compass points to the magnetic north pole. The difference between this direction and true north is the magnetic variation. The amount and direction of this variation is dependent upon where on the earth you are located.

NMEA0183 - A format (language) designed to permit communication between various types of marine electronic equipment. In essence this is a two-wire shielded, serial data link, permitting one device to talk while other devices listen. Numerous different sentences are available, permitting communication between various different devices.

NMEA2000 – A modern serial-data communications network to interconnect marine electronic equipment onboard vessels. Equipment designed to this standard will have the ability to share data, including commands and status, with other compatible equipment over a single signaling channel.

Product ID – A number, suffix, acronym or term that can identify a product.

Product name – The name of a Simrad product known from sales and other literature.

Route - A stored sequence of waypoints. These waypoints will be listed in the order in which you desire to follow them.

SimNet Source – Any product or device directly connected to SimNet or NMEA2000, or interfaced to SimNet via NMEA0183 or Robnet2.

Simrad Group – A number of Simrad products that are selecting and sharing the same data sources via the SimNet network.

Simrad Class 1 products – Simrad products that are SimNet controllers, i.e. they have an appropriate display and routines that can set up and control the SimNet.

Simrad Class 2 products – Simrad products that do not contain a SimNet controller. When connected to SimNet they will automatically pick the first available source on SimNet and lock on to that. When a Class 1 product is added to the Simrad Group, Class 2 products will automatically subordinate themselves to the Class 1 source selection.

SOG - Speed over ground is the actual speed of the vessel relative to the ocean floor.

True bearing – Bearing relative to true north; compass bearing corrected for compass error.

True heading – Heading relative to true north (the meridian).

Waypoint - A discrete point, stored in a navigator, located on the surface of the earth. Normally this point will be identified by Lat/Lon coordinates although in some systems it may be shown by T.D.'s.

XTE - Cross Track Error - Used to identify a vessels position relative to a straight line drawn between two waypoints. The amount the vessel is off to the left or to the right of this line is known as the track. It is normally displayed in thousands of a nautical mile, equal to 6 ft or 1.85 m.

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SIMRAD

Master the Elements